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WEATHER BUREAU WB-2

Weekly Synoptic Analyses, 5-, 2-, and 0.4- Mb. Surfaces for 1964

STAFF, UPPER AIR BRANCH,
National Meteorological Center

SILVER SPRING, MARYLAND
April, 1967

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WB-1. Monthly Mean 100-, 50-, 30-, and 10-Millibar Charts January 1964 through December 1965 of the IQSY Period. Staff, Upper Air Branch, National Meteorological Center: February 1967.

U.S. DEPARTMENT OF COMMERCE
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ESSA TECHNICAL REPORT WB-2

Weekly Synoptic Analyses, 5-, 2-, and 0.4- Mb. Surfaces for 1964 (based on observations of the Meteorological Rocket Network during the IQSY)

STAFF, UPPER AIR BRANCH,
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USCOMM-ESSA-DC WB 1077

CONTENTS

WEEKLY SYNOPTIC ANALYSES,
5-, 2-, AND 0.4-MB. SURFACES FOR 1964
(based on observations of the METEOROLOGICAL ROCKET NETWORK during the IQSY)

Staff, Upper Air Branch, National Meteorological Center

1. ABSTRACT

Data from the Meteorological Rocket Network and other sources, in addition to high-level rawinsonde observations have been employed to analyze a series of 5-, 2-, and 0.4-mb. charts. Methods employed for processing the various types of data as well as the analysis procedure are described.

The broadscale analyses, primarily covering the North American and adjacent ocean areas, are presented for each week of 1964, the first year of the International Years of the Quiet Sun period. A brief discussion of the circulation and temperature patterns in the middle and upper stratosphere as indicated by the charts is also presented.

2. INTRODUCTION

The Upper Air Branch of the Weather Bureau's National Meteorological Center, with the aid of a grant from the U. S. Army Material Command, undertook the task of analyzing a series of constant-pressure charts based on rocketsonde and very-high-level rawinsonde data. The area of analysis is primarily North America and adjacent ocean areas and the period is the International Years of the Quiet Sun (IQSY), January 1964 through December 1965. Previous studies [8, 16, 18] demonstrated the feasibility of utilizing data from the Meteorological Rocket Network [10, 19] for the representation of circulation patterns in the upper stratosphere and lower mesosphere (the region from approximately 30 to 60 km.). However, the available data permitted the analysis of only occasional samples, which provided at best a limited view of the region.

In recent years the frequency of rocketsonde observations has increased significantly. Although data coverage for the 30- to 60-km. layer is still

extremely sparse in comparison with that obtained at lower levels with the present-day rawinsonde network, it nevertheless appears to be adequate for preparation of broad-scale quasi-synoptic analyses on at least a weekly basis.

One of the analysis methods previously developed [16] for the portrayal of synoptic conditions in the upper stratosphere required a 10-mb. chart constructed from rawinsonde data to be used as a base or foundation for application of hydrostatic build-up techniques. However, the increased number of rawinsonde observations penetrating to the higher levels during the IQSY made it possible to use the 5-mb. surface as the base level for this series of charts.

The IQSY series of analyses at weekly intervals includes 5-, 2-, and 0.4-mb. (approximately 36, 42, and 55 km. respectively) charts nominally portraying synoptic conditions on each Wednesday of the analysis period. In addition to a description of the techniques and theory employed in obtaining these analyzed charts, a brief discussion of large-scale features is also included in the following presentation.

3. PROCESSING OF RAWINSONDE DATA

The preparation of high-level data for analysis presents many problems. Some of the difficulties encountered in the use of rawinsonde information, such as achieving compatibility between daytime and nighttime observations, extrapolation and interpolation of data, and identification of erroneous reports have been previously summarized [6, 7].

Temperature and height adjustments designed to compensate for instrumental radiation errors were applied to all 5-mb. rawinsonde reports. Initially an adjustment was made, which in essence reduced daytime values to the level of those reported from nighttime observations. The magnitudes of these day-night adjustments, which are intended to account for the effects of solar heating on the rod thermistor, were determined with the aid of a computer program which calculates monthly mean differences between reported daylight and darkness values. Input to this program consisted of all available 5-mb. data for 1964 from stations in North America and adjacent areas that employ United States outrigger-type radiosonde instruments.

Theoretical and laboratory studies [1, 12] of the rod thermistor used in present-day radiosondes indicate that a significant error may be induced by infrared cooling at stratospheric levels above 10 mb. Therefore a second adjustment based on estimates developed by Barr [3], was added to all 5-mb.

"nighttime" data, including observations actually in darkness as well as daytime reports that had been adjusted for solar-radiation error. The magnitude of the temperature correction is a function of reported temperature, while the height adjustment varies linearly with the temperature correction.

Rawinsonde data utilized for the 5-mb. analyses, were processed by computer methods. Input to the program consisted of North America and adjacent-area observations for the 7-, 5-, 4-, and 3-mb. levels in the form of punched cards obtained from the National Weather Records Center. Output listings included all observations for one week at each station. The data for levels other than 5 mb. were also listed in order to supply the analyst with as much supplementary information as possible. Thermal winds and corresponding horizontal temperature gradients were computed for the layers from 7 to 5, 7 to 4, and 5 to 4 mb. In addition, the 5-mb. temperature and height adjustment schemes, including calculation of the required solar elevation angles, were incorporated into the system.

4. PROCESSING OF ROCKETSONDE DATA

Rocket winds and temperatures form the basis for analysis of the 2- and 0.4-mb. charts and in addition are used together with rawinsonde observations at 5 mb. The information for each week was extracted primarily from the Data Reports, Meteorological Rocket Network (MRN) Firings [9].

The basic steps in the extraction of rocketsonde information and the computation of heights for the 5-, 2-, and 0.4-mb. surfaces were as follows:

1. Temperatures observed above 40 km. with the Arcasonde 1A instrument were reduced in accordance with a recent theoretical study [4]. The magnitude of this correction increases to about 4°C. at 50 km. and 12°C. at 60 km. Published temperature data obtained by the Deltasonde generally include a correction [17] and hence were utilized without further adjustment. The great majority of observations were made with the above mentioned instruments.

2. An initial estimate of the height field must be made before the temperature at a given constant-pressure surface can be selected. This estimate was obtained by extrapolating the trend of the height field from the analyzed charts for the previous two weeks. The selected temperature value was then utilized together with that derived from the previously completed lower-level analysis for the computation of a layer-mean temperature.

3. Heights for the upper surface were computed hydrostatically with the aid of the mean temperature obtained as described above.

4. Since the analyses are intended to portray synoptic-scale features, portions of wind component profiles that exhibited rapid oscillations in the vertical were smoothed.

5. Wind components were extracted from the profiles at the height of the constant-pressure surface and a resultant wind was computed.

6. Thermal winds were determined for 6-km. layers surrounding each pressure surface.

5. ANALYSIS PROCEDURE

Conventional techniques, including differential analysis methods, were utilized to construct the 5-, 2-, and 0.4-mb. charts. The analysis system consisted of the following steps:

1. Isotherms were derived with the aid of processed temperatures and the computed thermal winds. Where possible, time-height sections of temperature were plotted as a further aid in deriving the isotherms.

2. A mean temperature field within the layer between the previously analyzed lower surface and the selected surface was derived graphically. This mean field represents a geopotential thickness, which when added to the lower-level height field, yields a smooth, conservative first approximation to the contour pattern at the upper surface. Daily 10-mb. charts, analyzed by a computerized system [5], were employed for the 5-mb. build up.

3. Reported winds and computed heights for individual stations were used to adjust the first approximation of the contour field. Winds were accorded the highest priority for this adjustment.

4. The analysis was checked for vertical and temporal consistency. For example, centers of systems, as well as ridges and troughs were examined with the aid of all available data to verify vertical slope and movement with time. Time-height sections and height-change charts were especially useful for these purposes. Additional data considered for the analyses included rocketsonde observations taken at Sardinia by the German Meteorological Service [2] and results of rocket-grenade and pitot-static tube experiments conducted at Wallops Island and Fort Churchill [15].

The above procedures appear to produce excellent results at 5 mb. and were successfully applied to obtain the 2- and 0.4-mb. charts. Generally, only slight adjustments of the first approximation height fields were necessary

at the 5- and 2-mb. levels. However, rather formidable analysis problems were evident at the 0.4-mb. level. Foremost among these was the sparsity of observations. The area of analysis presented in the charts at the higher levels has thus been reduced in accordance with the available data. Another difficulty was the apparent occurrence of large day-to-day temperature changes, at times exceeding 10°C., as well as rapid oscillations within many wind profiles. In some cases, deviations of reported temperatures and winds from the fields derived by differential analysis techniques could be accounted for by obvious synoptic changes. Occasionally, it was impossible to make a reasonable reconciliation of station values with the values determined by differential analysis.

A further analysis problem arises from the apparent intersection of the stratopause with the 0.4-mb. level. Since the normal stratospheric temperature inversion ceases at the stratopause level, the graphical method for obtaining mean temperature, which depends on the existence of a linear profile, is no longer valid. Thus, especially at lower latitudes, adjustments must be made in the computed heights.

In the course of analysis of charts for summer, an additional problem became apparent. During that season the circulation at the upper surfaces (2 and 0.4 mb.) would be expected to follow the pattern established for lower levels, i.e. rather uniform easterly flow about an anticyclone centered at or very near the pole. However, on a typical summertime 0.4-mb. chart, the majority of the reported rocketsonde winds exhibit significant southerly components. If these winds were to be given full weight in the analysis, the resulting pattern would consist of contours oriented from southeast to northwest, spiraling toward a high center located, apparently, over northern Europe.

The prevalence of positive meridional components in summertime rocketsonde winds has been noted previously [1]. Recent studies [13, 14] utilizing MRN data for several summers have demonstrated that the meridional wind component due to the diurnal tide reaches maximum southerly strength about noon, local time. Since most MRN firings occur near noon the measured winds naturally contain this component. The adjustment to compensate for the effects of the diurnal variation is therefore most noticeable on the summertime charts.

Although careful consideration of high-level data allows a broad-scale depiction of circulation patterns up to 0.4 mb., the sparsity of reports requires an increasing amount of subjectivity as the analysis proceeds to this high level. As yet the analyst has little in the way of synoptic models for

guidance with respect to the probable contour and isotherm patterns and the phase relationship between them in areas of sparse data. In spite of these factors, surprisingly little alteration in the principal features of the circulation and temperature distribution shown in the final analysis can be made without inordinately violating some of the data. Even so, the same degree of accuracy that is customarily found in the analysis of charts at lower levels should not be expected in these charts. In general, the values with which contours and isotherms are labelled and more particularly the spacing between them are only approximations.

It was not convenient to use the same contour interval throughout the year. During the winter months, the intense westerlies necessitated the use of 320-geopotential meter contour intervals. A 160-gpm. interval was sufficient to depict the more moderate summer easterlies, but an 80-gpm. interval was needed to delineate the light and variable winds during the spring and fall changeover periods. Intermediate dashed contours were also used to outline areas of relatively weak gradient. The changes in contour interval, as indicated by a legend in the lower right-hand corner of each chart, show the changes in intensity of circulation from season to season and from one level to another. Isotherms are drawn and labelled at 5°C. intervals at all levels throughout the year. A chart is also presented (see Station Model and Reporting Rocket Stations) which illustrates the way the reported data closest to map-time have been plotted on these charts.

6. DISCUSSION of 1964 CHARTS

This section is intended to present a brief description of the circulation patterns at the 5-, 2-, and 0.4-mb. surfaces from January through December, 1964. At the beginning of the period, a typical cold winter cyclone dominated the circulation in the middle and upper stratosphere. The charts for the first week showed a cyclone slightly displaced from a polar position and a trough outlined over the west coast of the United States by the wind soundings at Fort Greely, Alaska and Point Mugu, California. Intensification of the polar vortex to at least the 0.4-mb. level was verified by the increase in wind with height of nearly every sounding. The general southward displacement of the subtropical ridge line with increasing height indicated that the areal extent of the polar cyclone also increased with altitude.

The anticyclone in the area of the Aleutian Islands was quite active throughout the entire middle and upper stratosphere during the early part of 1964. A pronounced zonal asymmetry of the temperature field is seen on the 5-mb. chart for January 1, with the -25°C. warm center associated with the Aleutian anticyclone at nearly the same latitude as the -70°C. center of the

cyclone over Greenland. The anticyclone intensified while migrating eastward during the second and third weeks in January. At the 5- and 2-mb. levels, easterly winds were evident over the western portion of the United States. However, the change to westerlies at the 0.4-mb. level, suggests a west or northwest slope of this system with height.

The polar cyclone reached maximum winter intensity in late January and then began filing in conjunction with a warming trend which first appeared at the upper level and at high latitudes. Relatively high temperatures reported at Fort Greely during February were associated with a second period of increased activity of the Aleutian anticyclone. Data for February indicate a distinct warm center, which originated in Asia, and slowly moved eastward across northern Canada. The intensifying anticyclone expanded northward, and by March 4 the polar vortex had migrated from the Pole toward Eurasia. The anticyclone temporarily dominated the circulation at high latitudes, and stratospheric easterlies were observed over North America.

The pulsations of the Aleutian anticyclone may be seen in the time sections of extracted heights and temperatures shown in figures 1-5. The large-scale changes that occurred from early January through mid-March are especially evident in the sections for Fort Greely and Fort Churchill. A most pronounced height increase of about 2.8 km. at the 0.4-mb. level took place at Churchill between February 19 and 26. Temperature rises over the same station and for the same time period amounted to 26°C., 26°C. and 30°C. at 0.4-, 2- and 5-mb. levels, respectively. These rises resulted in temperatures at or above summertime values.

Westerly flow, diminished in strength, was re-established over North America by April 8, and can be linked with the northward movement and expansion of the zonal trough seen the previous week. However, this late winter return to cyclonic circulation quickly gave way to light and variable winds of the late April and early May transitional period. Complete hemispheric charts at 10-mb. and lower levels, coupled with reported rocketsonde data, suggest that the final change to summertime conditions was more advanced at the 0.4-mb. level. The synoptic changes resulted from an expanding anticyclone moving northward over Europe. As this system neared the Pole, the cyclone split into two distinct cells which slowly filled while drifting southward. By May 20, the anticyclone was firmly established over the polar area at all levels.

The summertime polar anticyclone expanded steadily until reaching peak intensity in late July. Highest wind speeds were reported over middle latitude stations at the highest level, as was the case with the wintertime polar cyclone. In addition to the meridional components associated with the

diurnal effect (especially evident at 0.4 mb.), many of the reported winds during the summer at the various levels deviated from easterly by 10 to 30 degrees. These deviations strongly suggest the existence of small-scale perturbations in the mean easterly flow. The lack of sufficient observations, however, precluded a definition of the smaller features within this circulation pattern.

The summertime anticyclone decayed throughout the month of August. On August 19, perturbations were seen at high latitudes at the 5-mb. surface, and during the following weeks the intensity of the circumpolar easterlies decreased at higher levels. An inspection of the daily analyses from 100 to 10 mb. indicated that the breakdown of the anticyclone proceeded upward through the stratosphere. By September 16, the rapidly weakening anticyclone had been replaced by the wintertime cyclone at all levels. The vestiges of the anticyclonic circulation remained as a zonal ridge line, which migrated southward as the cooling polar vortex expanded and intensified.

The early winter westerlies exhibited considerable variability. During October, November, and December, the winds at high latitude stations varied markedly with the pulsations of the Aleutian anticyclone. On October 28, the Aleutian anticyclone center was located over Alaska and apparently sloped eastward and intensified with height. The center moved eastward until early November, but then retreated westward to a position over Asia. Height changes at the 0.4-mb. level associated with the rapid development and movement of the anticyclone during this period were quite pronounced (see Figs. 1-5). While the large positive height changes were taking place over northwestern North America, equally large decreases occurred during the beginning of the period over more southern latitudes. The latter changes were undoubtedly associated with a southward displacement of the polar trough. Pulsations of the Aleutian anticyclone continued during the following two months, but with less intensity than that indicated by the early November event.

Winds at low latitudes also showed variability in conjunction with the growth and movement of the subtropical ridge over the Atlantic Ocean. On December 23, this ridge expanded and moved northward. At the same time, the anticyclone over the Kamchatka area also intensified. The polar cyclone thus became elongated and a pronounced trough was seen over North America oriented in a northeast-southwest direction. This type of circulation pattern has been associated with conditions leading to large-scale mid-winter warmings of the stratosphere. However, in this case no such event followed. The following week the flow returned to nearly zonal in the middle and high latitudes, with weak and variable winds at lower latitudes.

Fig. 1 — FORT GREELY, ALASKA

ANALYZED VALUES EXTRACTED FROM WEEKLY 5, 2, and 0.4-MB CHARTS

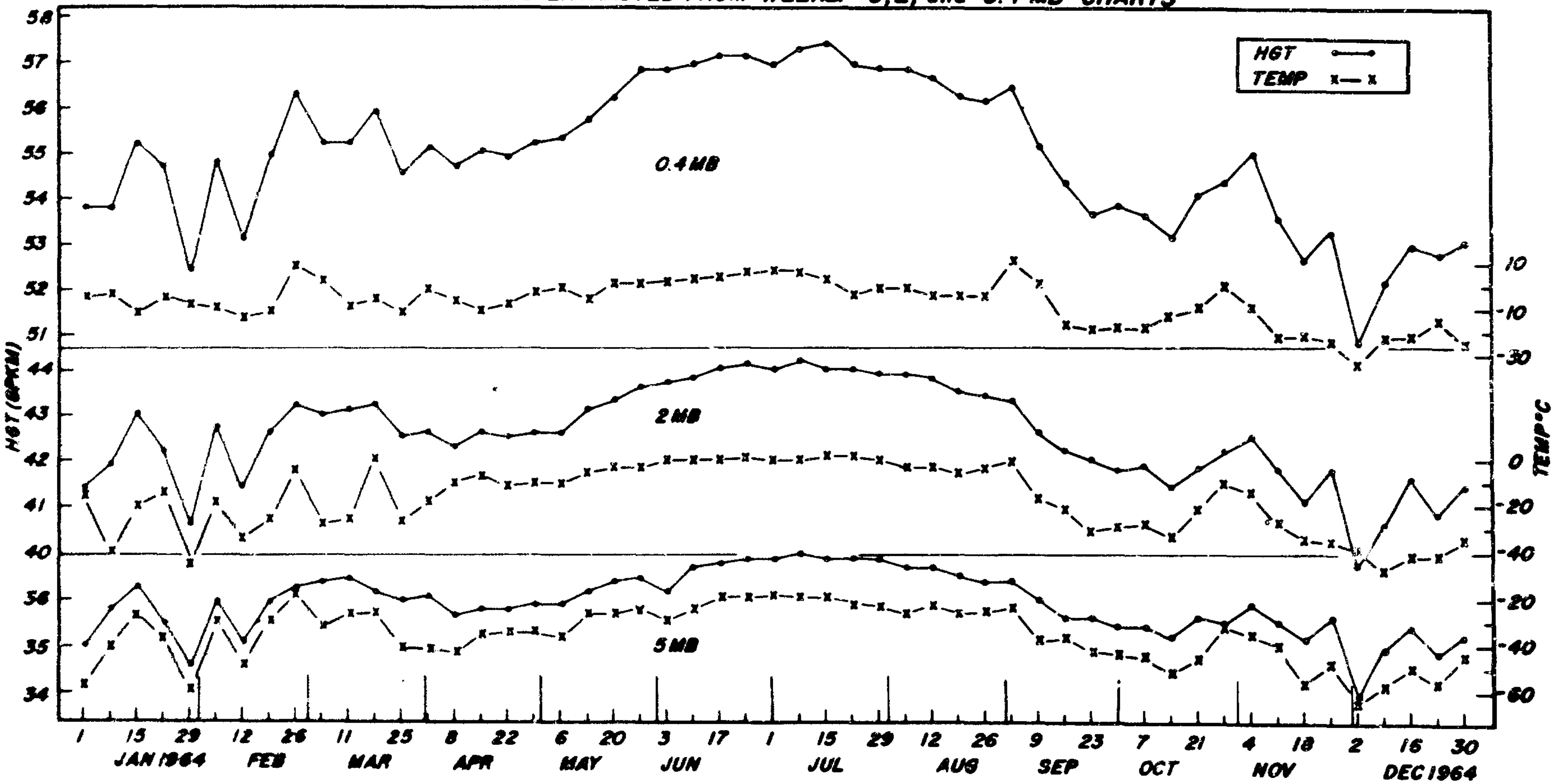


Fig. 2 — FORT CHURCHILL, CANADA

ANALYZED VALUES EXTRACTED FROM WEEKLY 5; 2; and 0.4-MB CHARTS

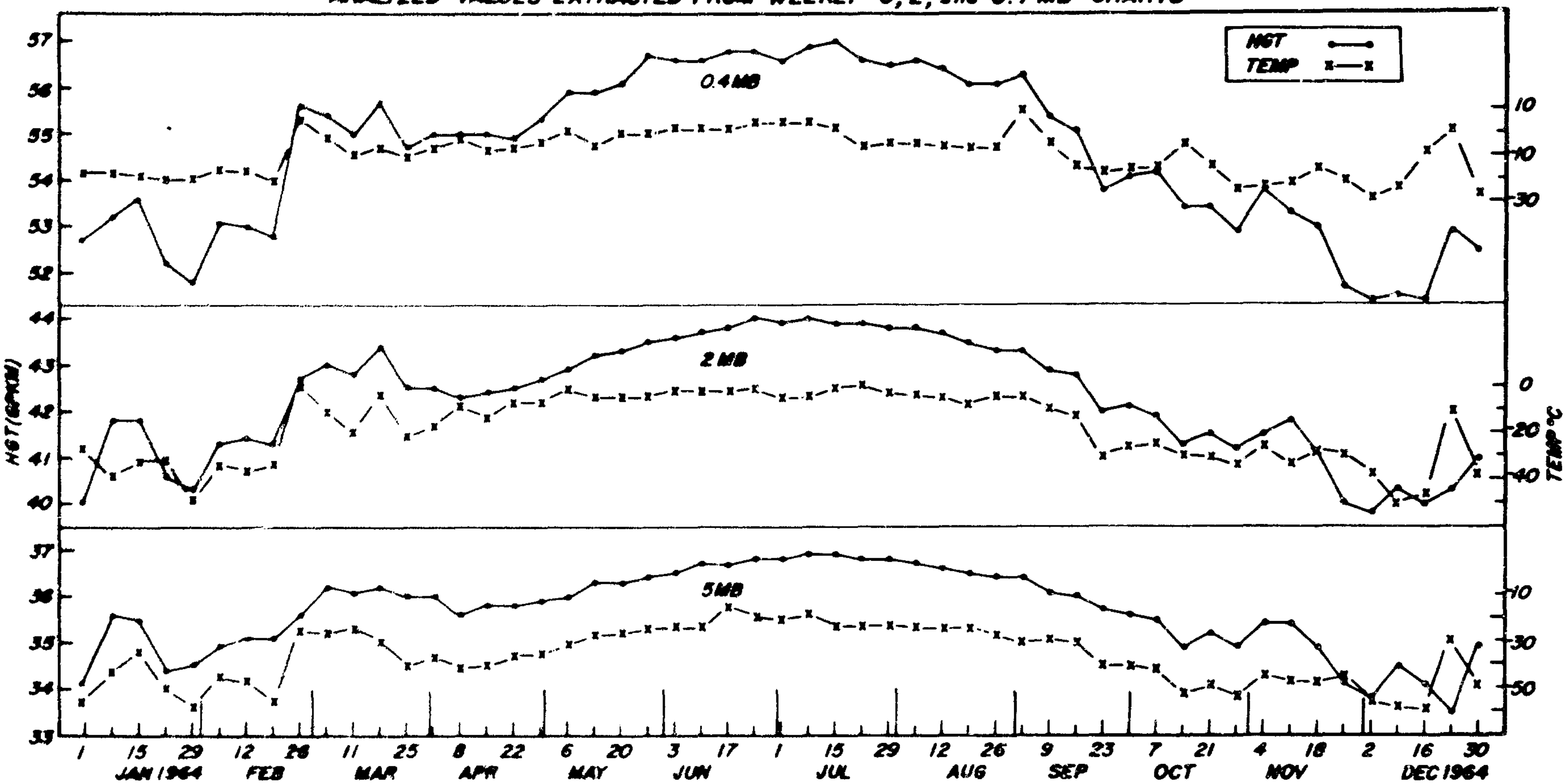


Fig. 3 — WALLOPS ISLAND, VA.

ANALYZED VALUES EXTRACTED FROM WEEKLY 5-, 2-, and 0.4-MB CHARTS

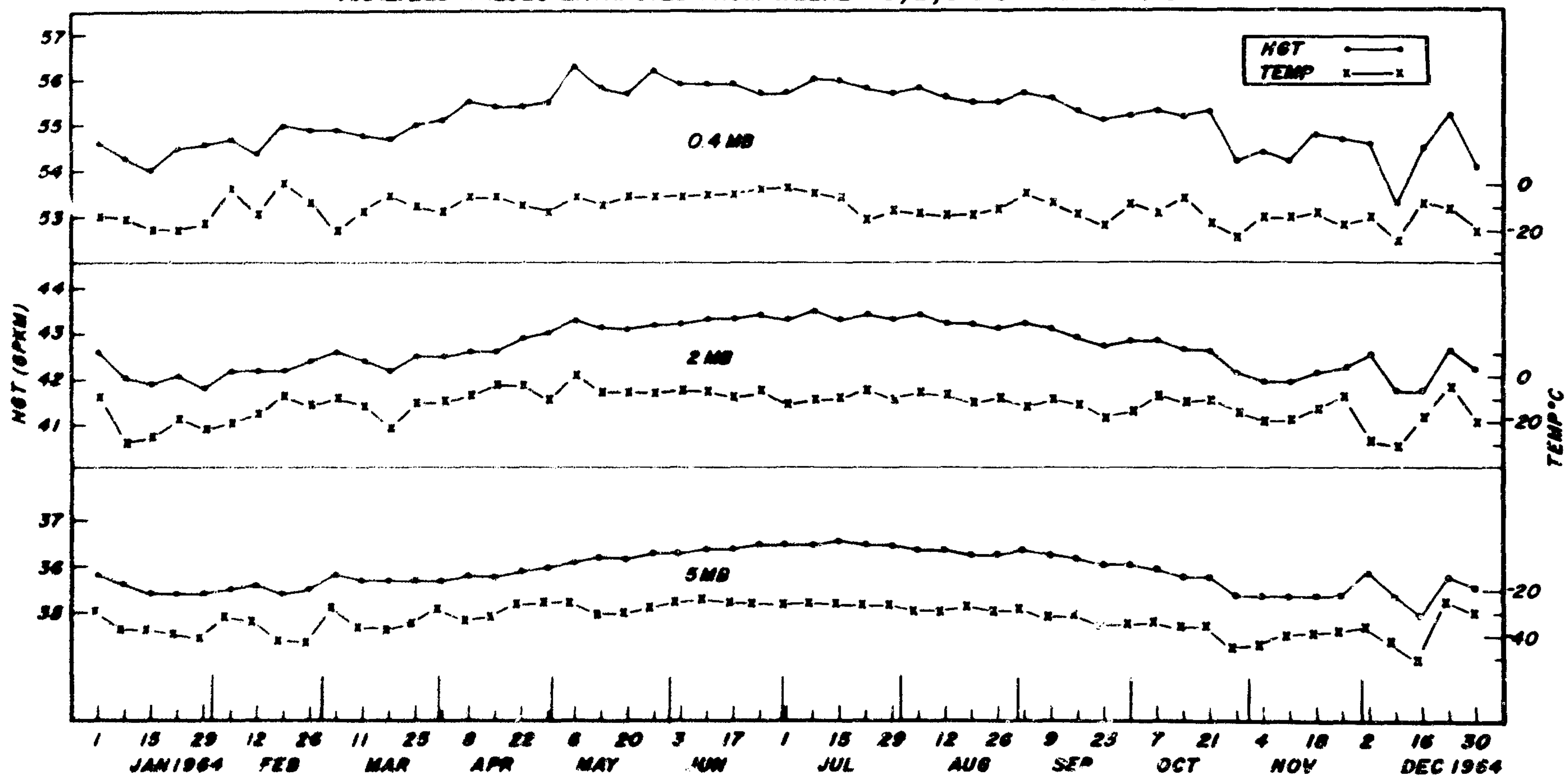


Fig. 4 — WHITE SANDS, N.MEX.

ANALYZED VALUES EXTRACTED FROM WEEKLY 5, 2, and 0.4MB CHARTS

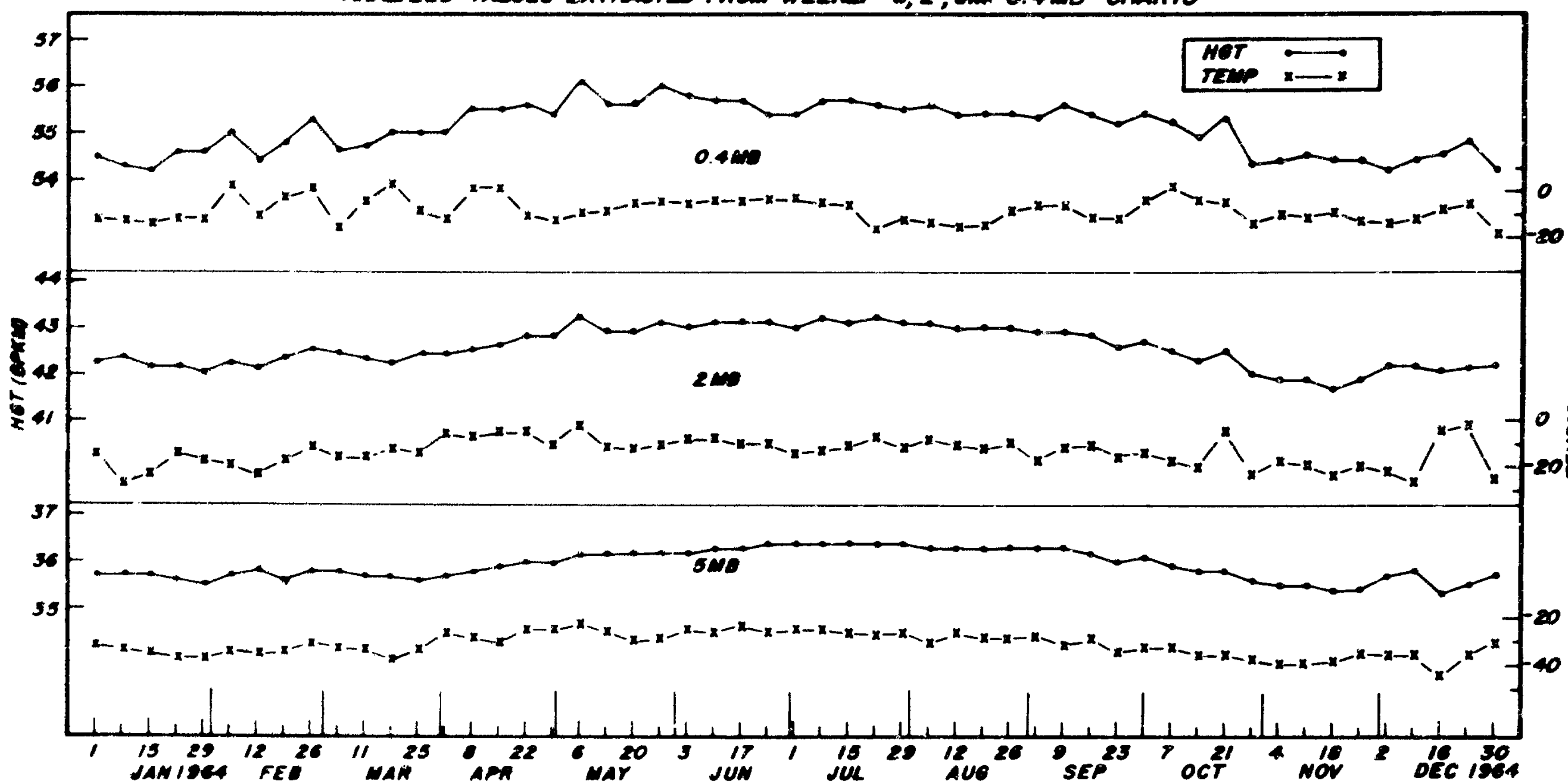
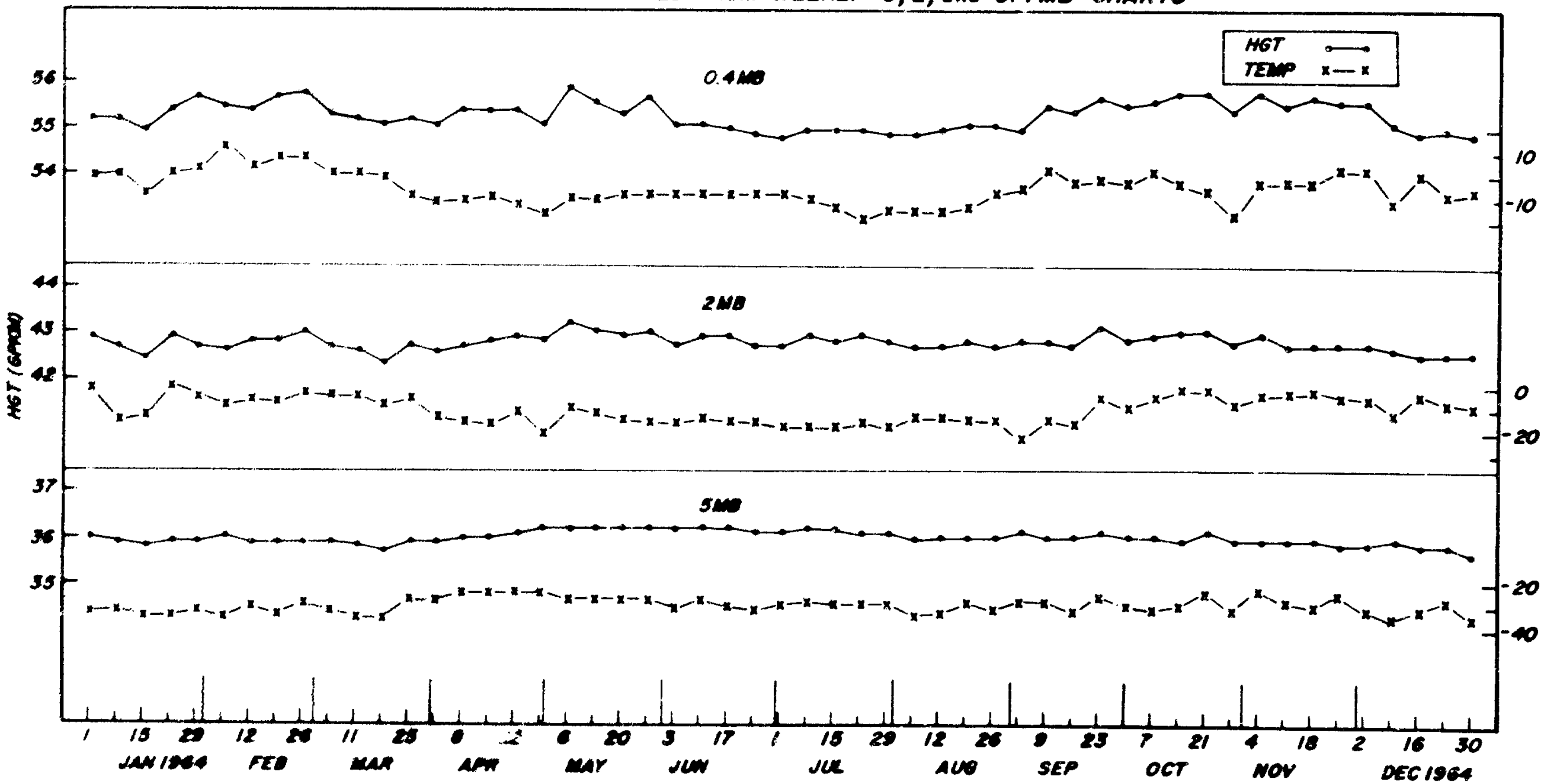


Fig. 5 — AN JA, B.W.I.
ANALYZED VALUES EXTRACTED FROM WEEKLY 5; 2; and 0.4MB CHARTS



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Weather Bureau personnel actively engaged in the analysis project were:

Project Manager - Frederick G. Finger

Analysis Supervisor - Calvin E. Anderson

Research Coordinator - Harold M. Woolf

Project Analysts - M. E. Gelman, L. J. Hortch, and H. M. Hess

Data Processing L. P. Mannello, J. A. Booth and S. F. Wilkes

Computer Operations - K. W. Johnson, W. P. Townshend, and J. H. Yeakel.

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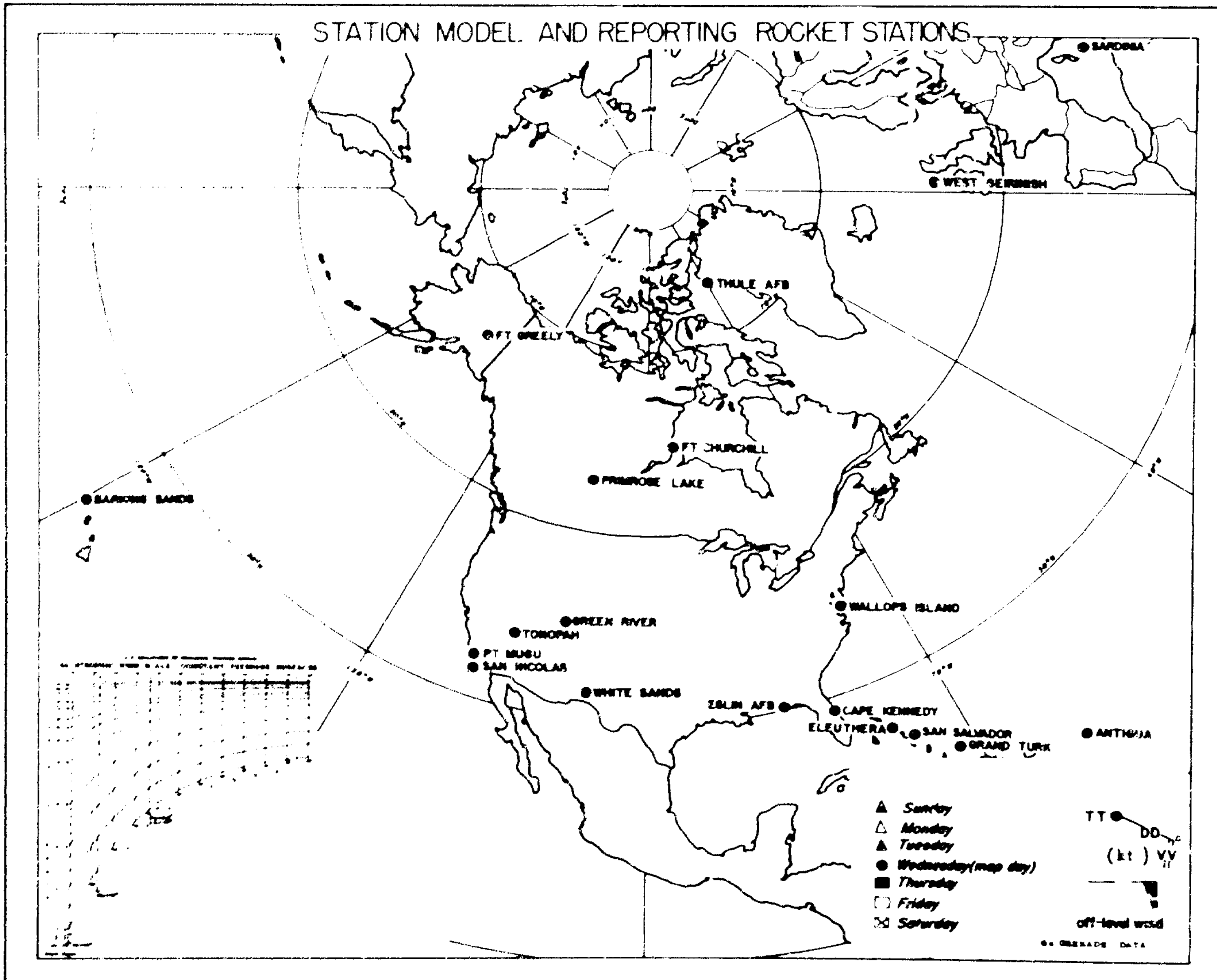
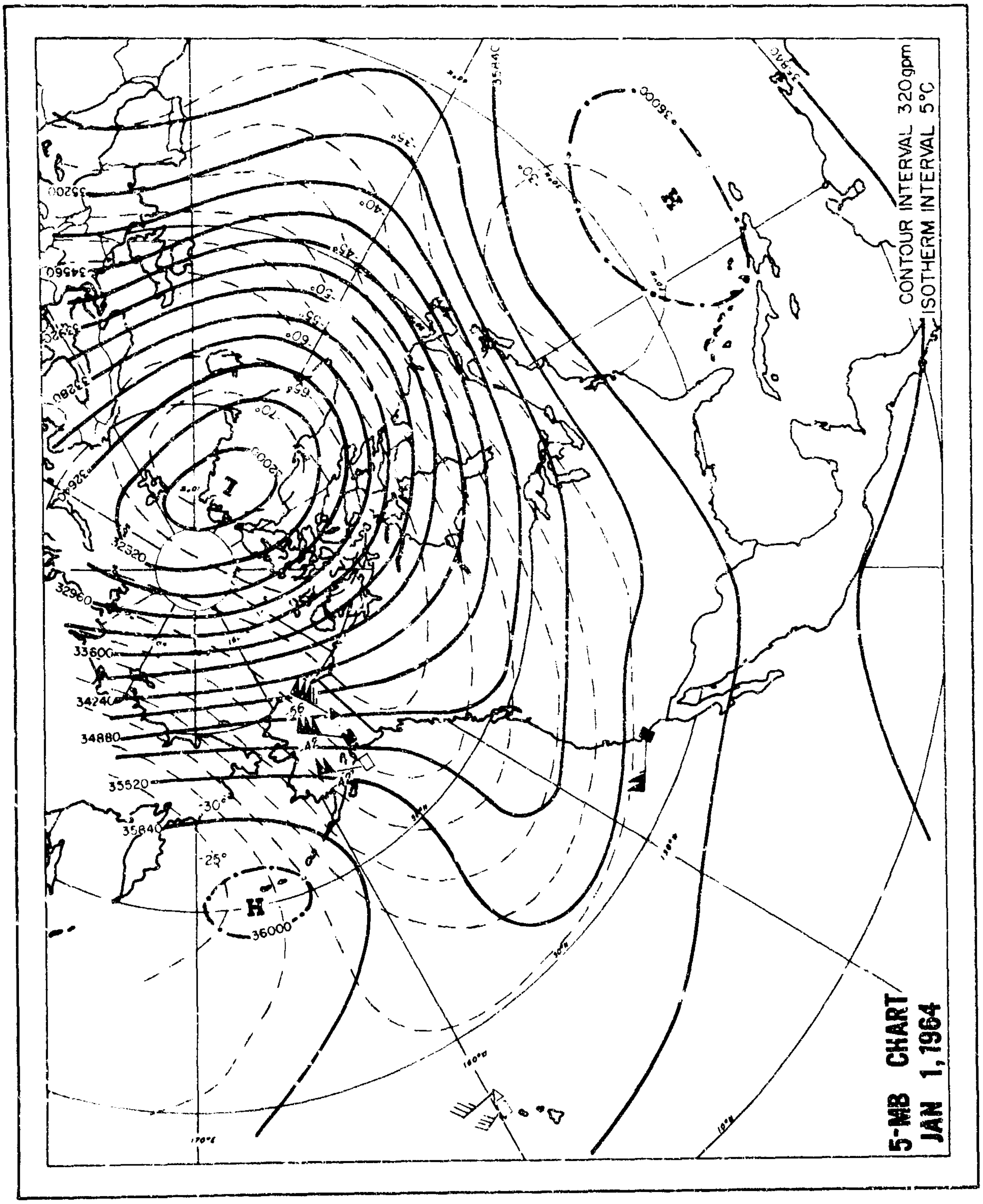
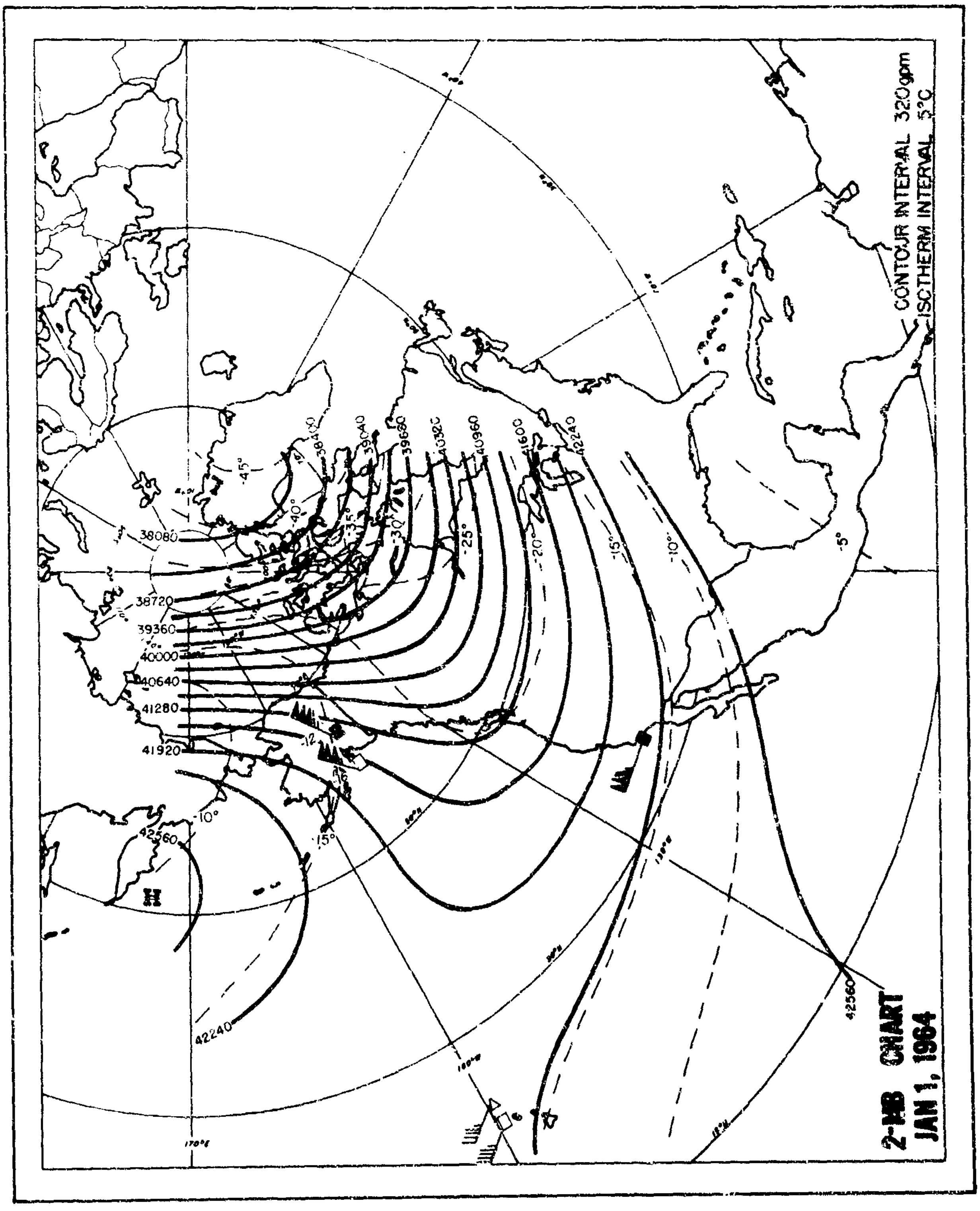
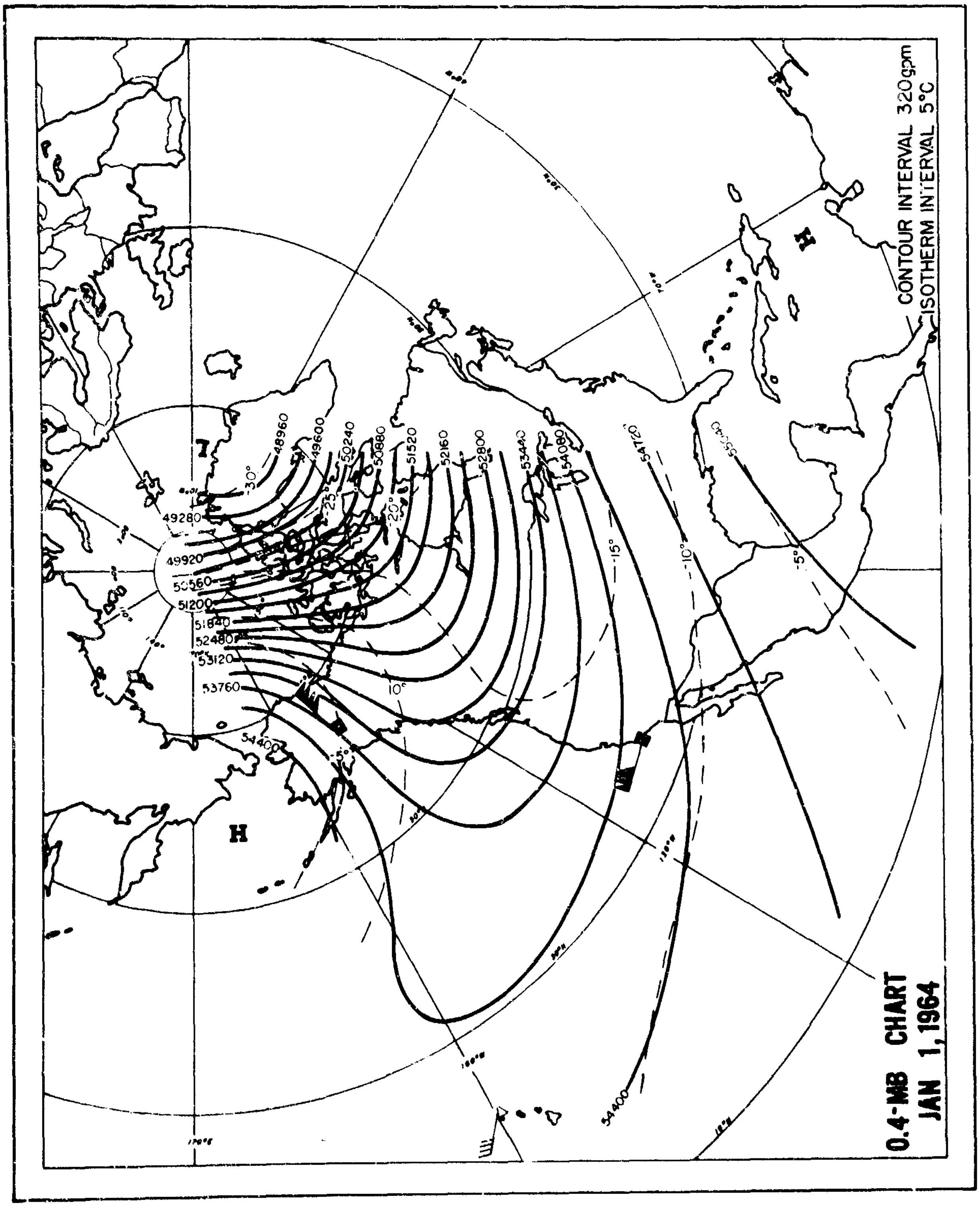

STATION MODEL AND REPORTING ROCKET STATIONS
SARDINIA
THULE AFB
FT GREELY
FT CHURCHILL
PRIMROSE LAKE
WALLOPS ISLAND
GREEN RIVER
TONOPAH
PT MUGU
SAN NICOLAS
WHITE SANDS
EGLIN AFB
CAPE KENNEDY
ELEUTHERA
SAN SALVADOR
GRAND TURK
ANTIGUA
Sunday
Monday
Tuesday
Wednesday (map day)
Thursday
Friday
Saturday
TT
DD
(kt) VV
off-level wind



5-MB CHART
JAN 1, 1964



2-MB CHART
JAN 1, 1964
CONTOUR INTERVAL 320 gpm
ISOTHERM INTERVAL 5°C
38080
38720
39360
40000
40640
41280
41920
42560
42240
42560
-45°
-40°
-35°
-30°
-25°
-20°
-15°
-10°
-5°
-10°
-15°


0.4-MB CHART
JAN 1, 1964
CONTOUR INTERVAL 320gpm
ISOTHERM INTERVAL 5°C
49280
49920
50560
51200
51840
52480
53120
53760
54400
48960
49600
50240
50880
51520
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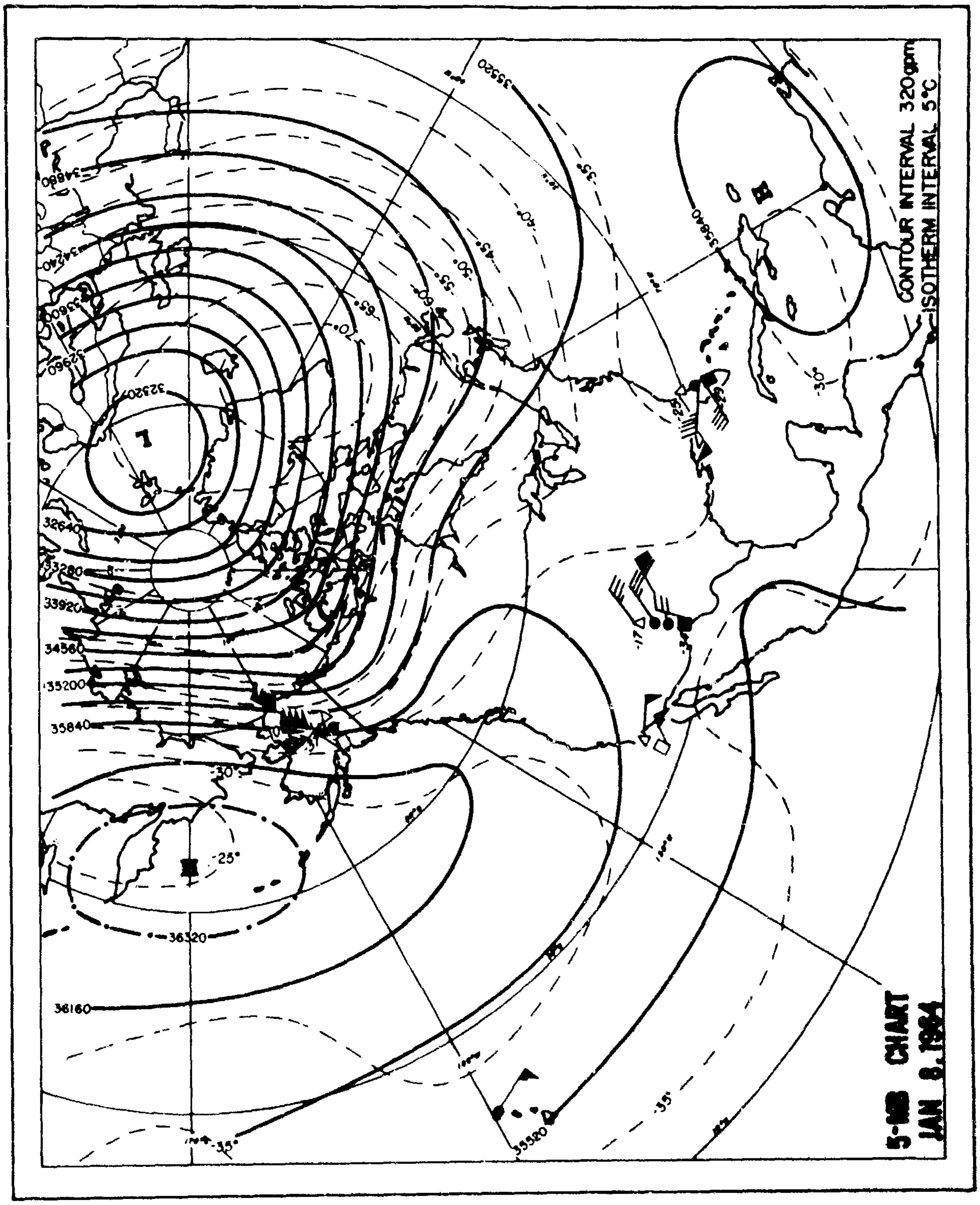
-15°
-10°
-5°


5-MB CHART
JAN 8, 1964
CONTOUR INTERVAL 320gpm
ISOTHERM INTERVAL 5°C
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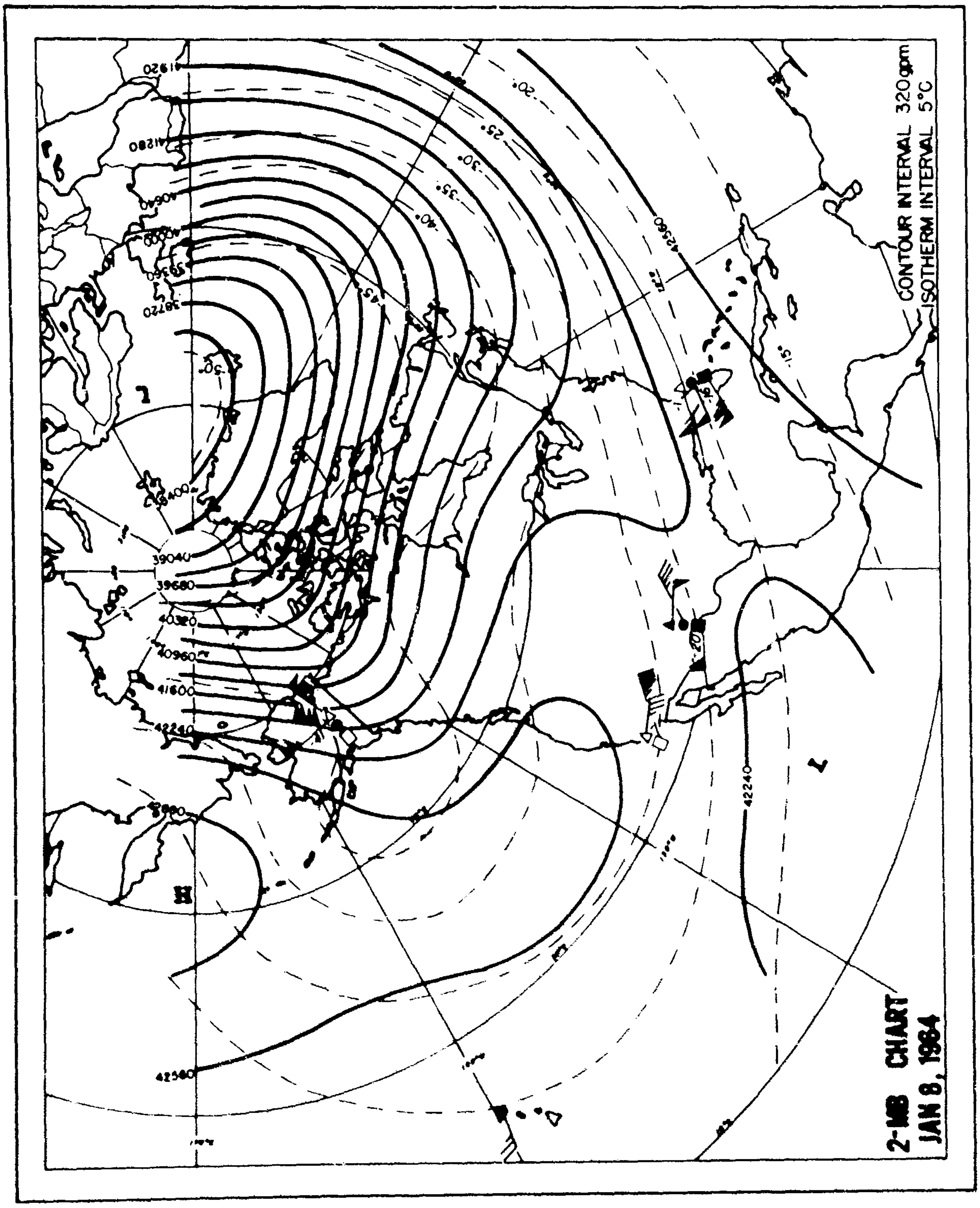
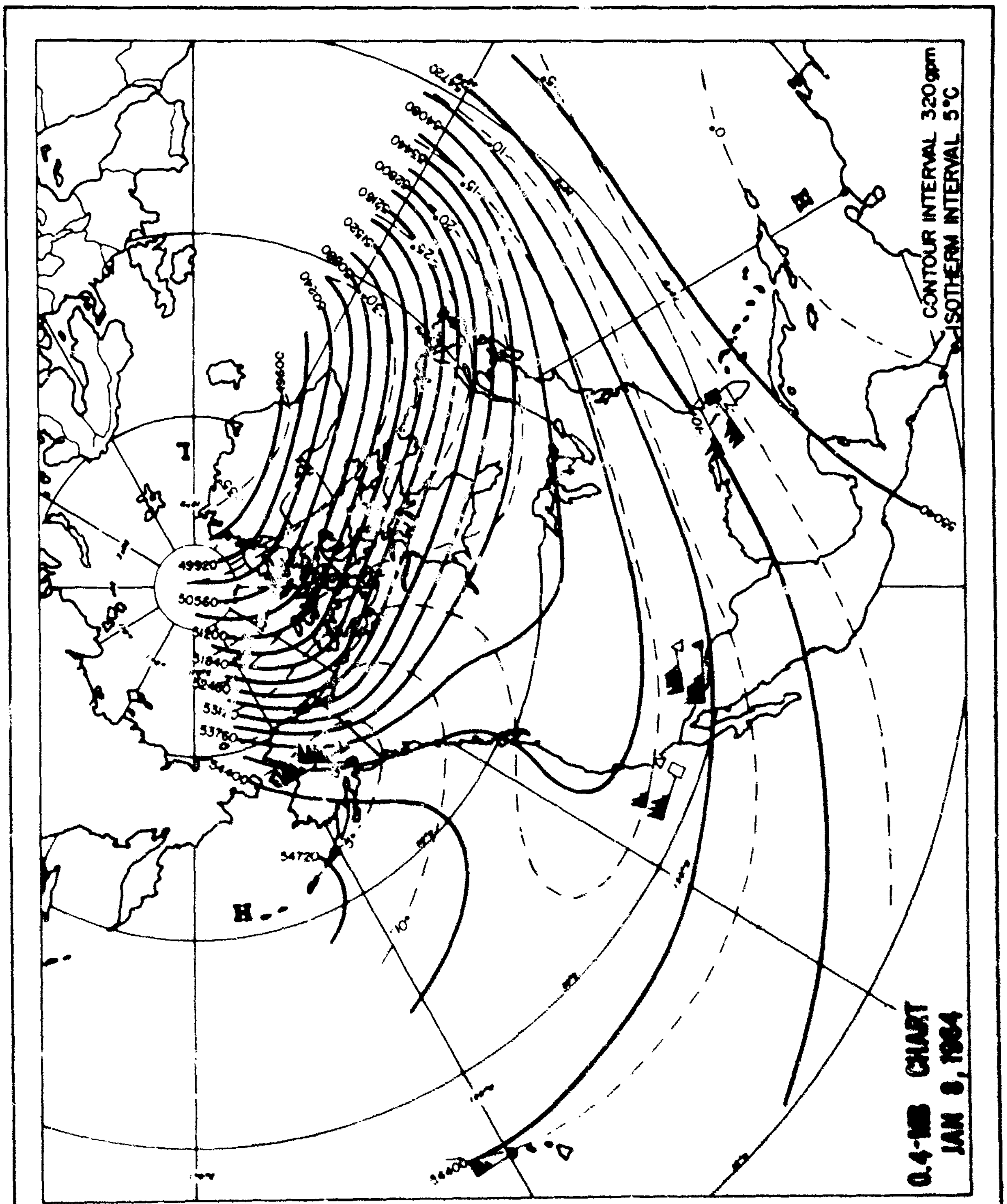
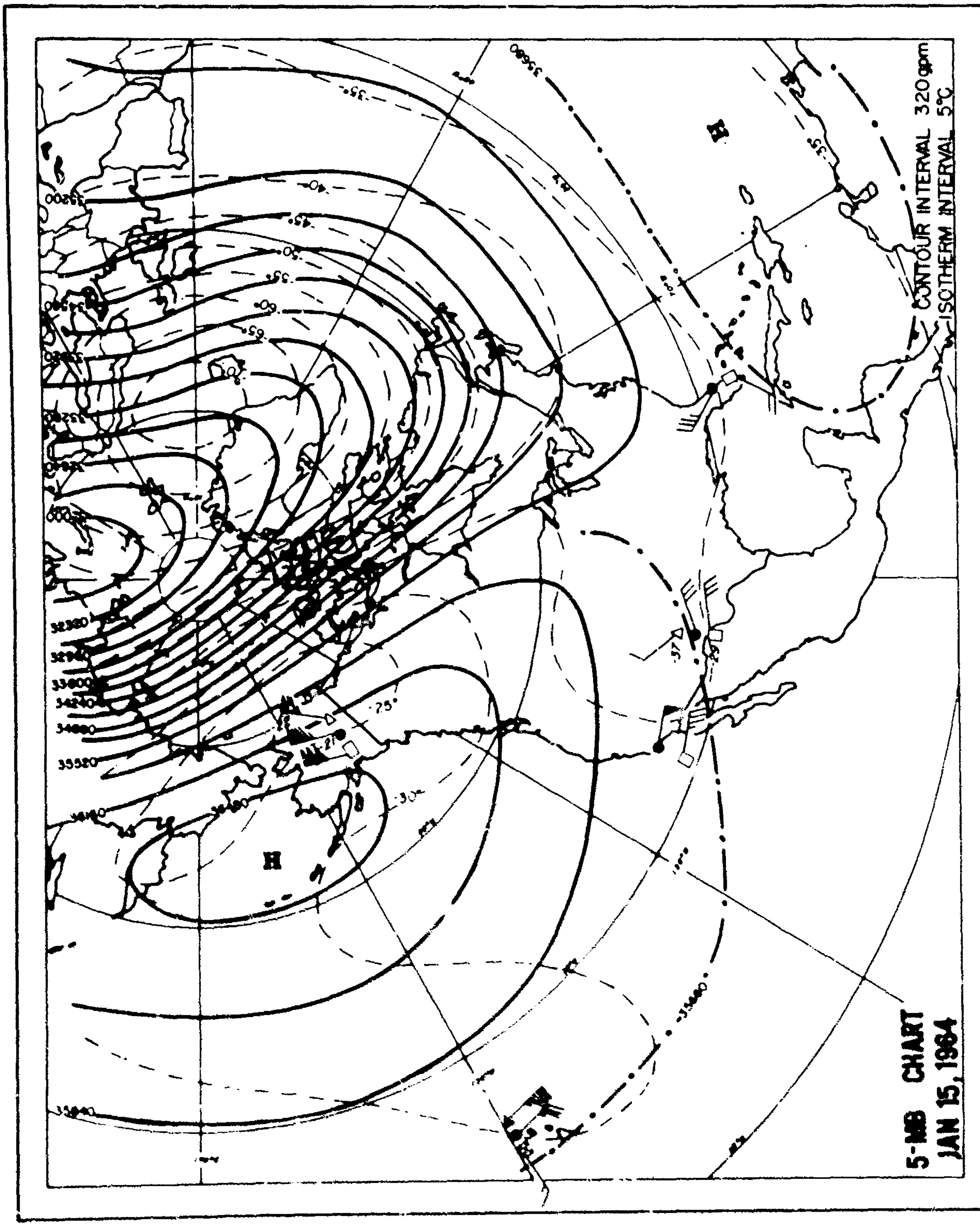
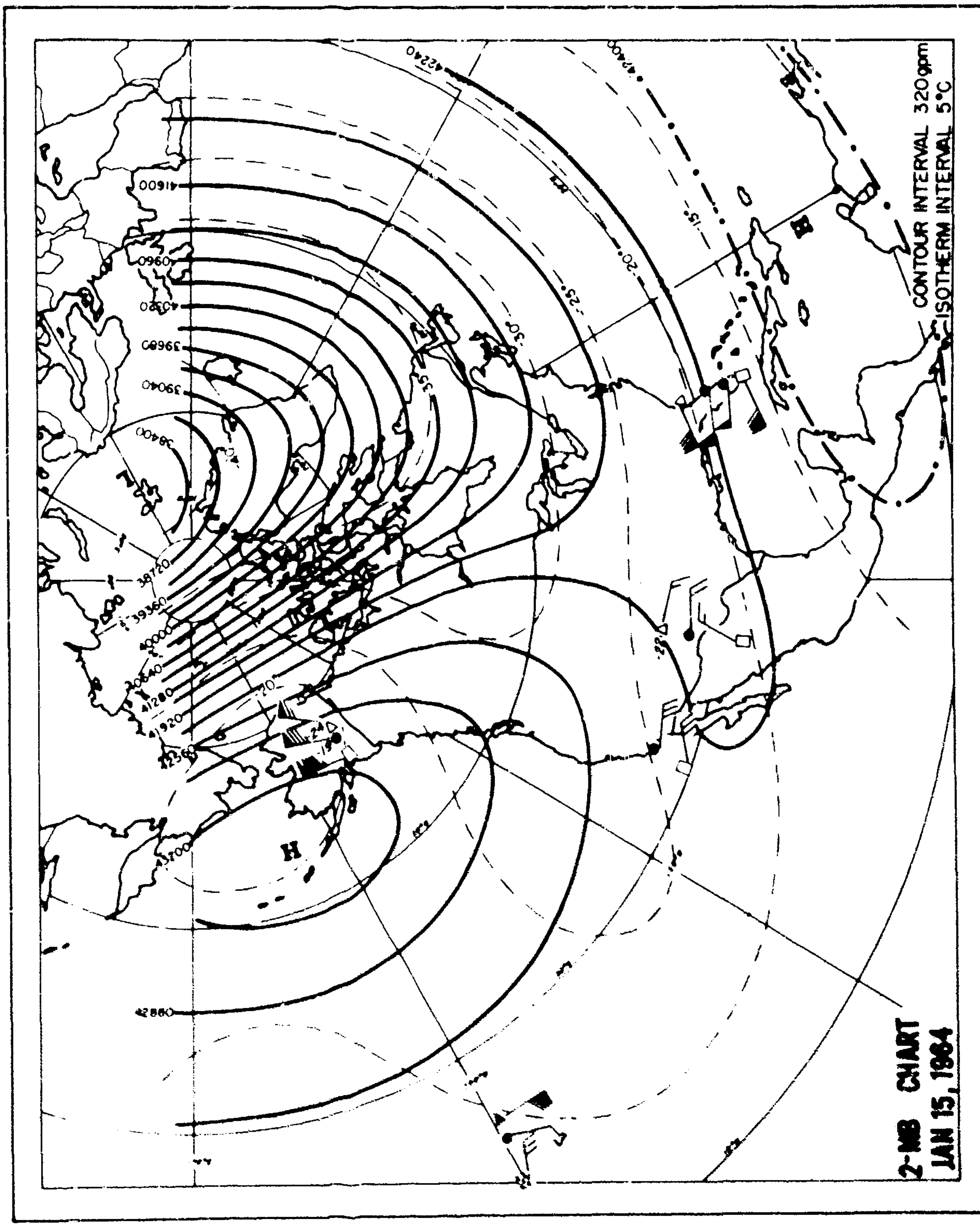
33280
33920
34560
35200
35840
36160
36320
35520

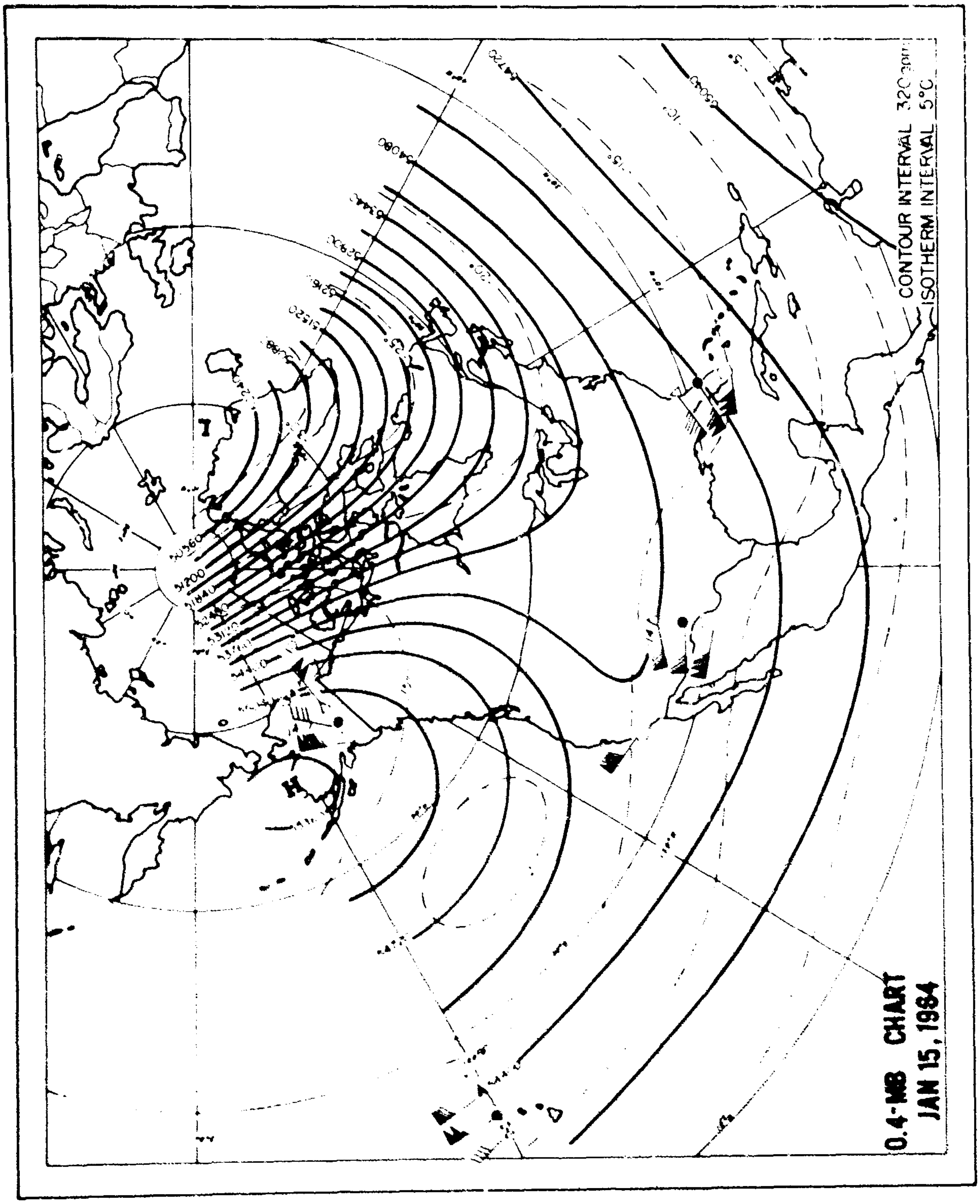

2-MB CHART
JAN 8, 1964
CONTOUR INTERVAL 320 gpm
ISOTHERM INTERVAL 5°C

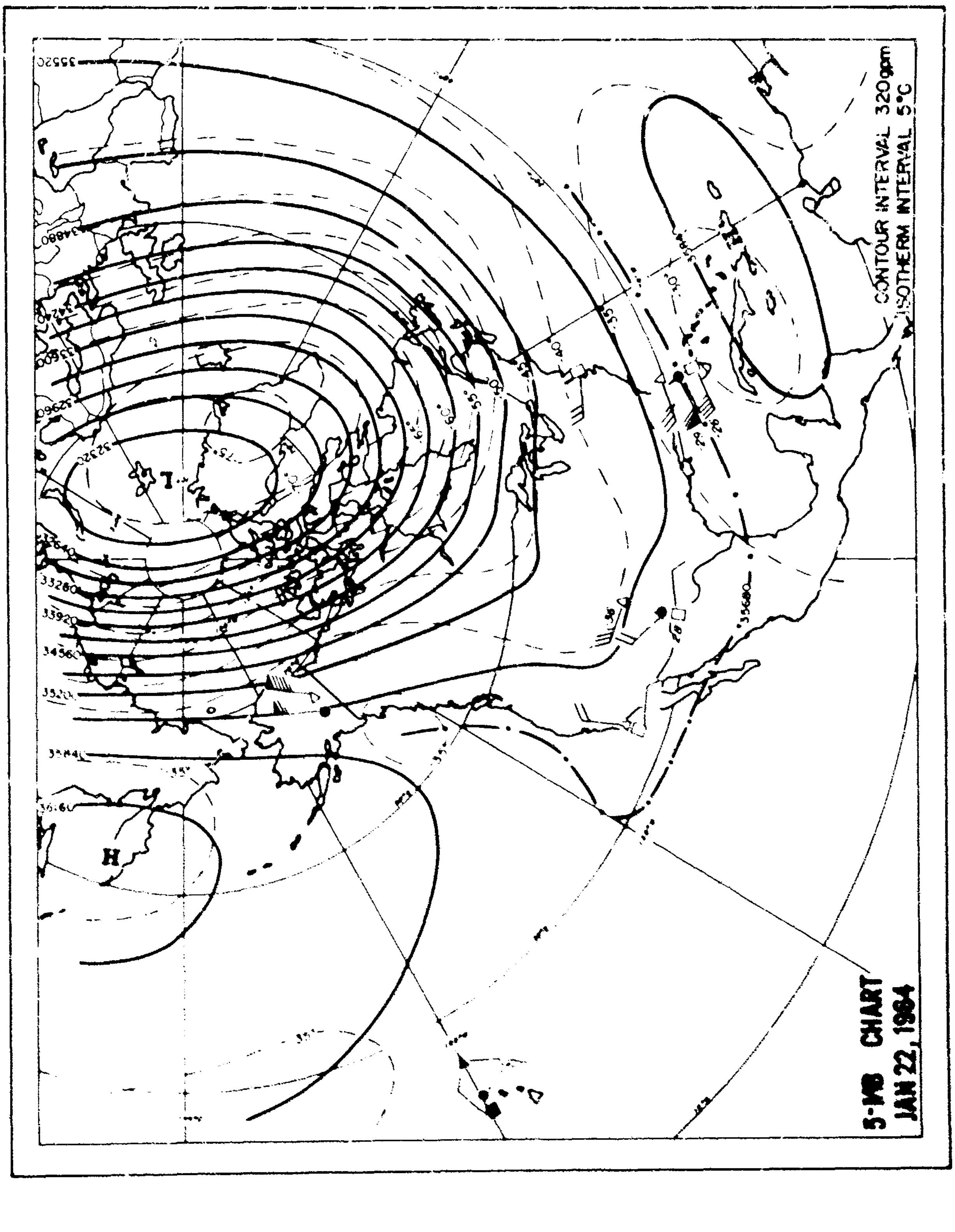

0.4-MB CHART
JAN 8, 1964
CONTOUR INTERVAL 320 gpm
ISOTHERM INTERVAL 5°C

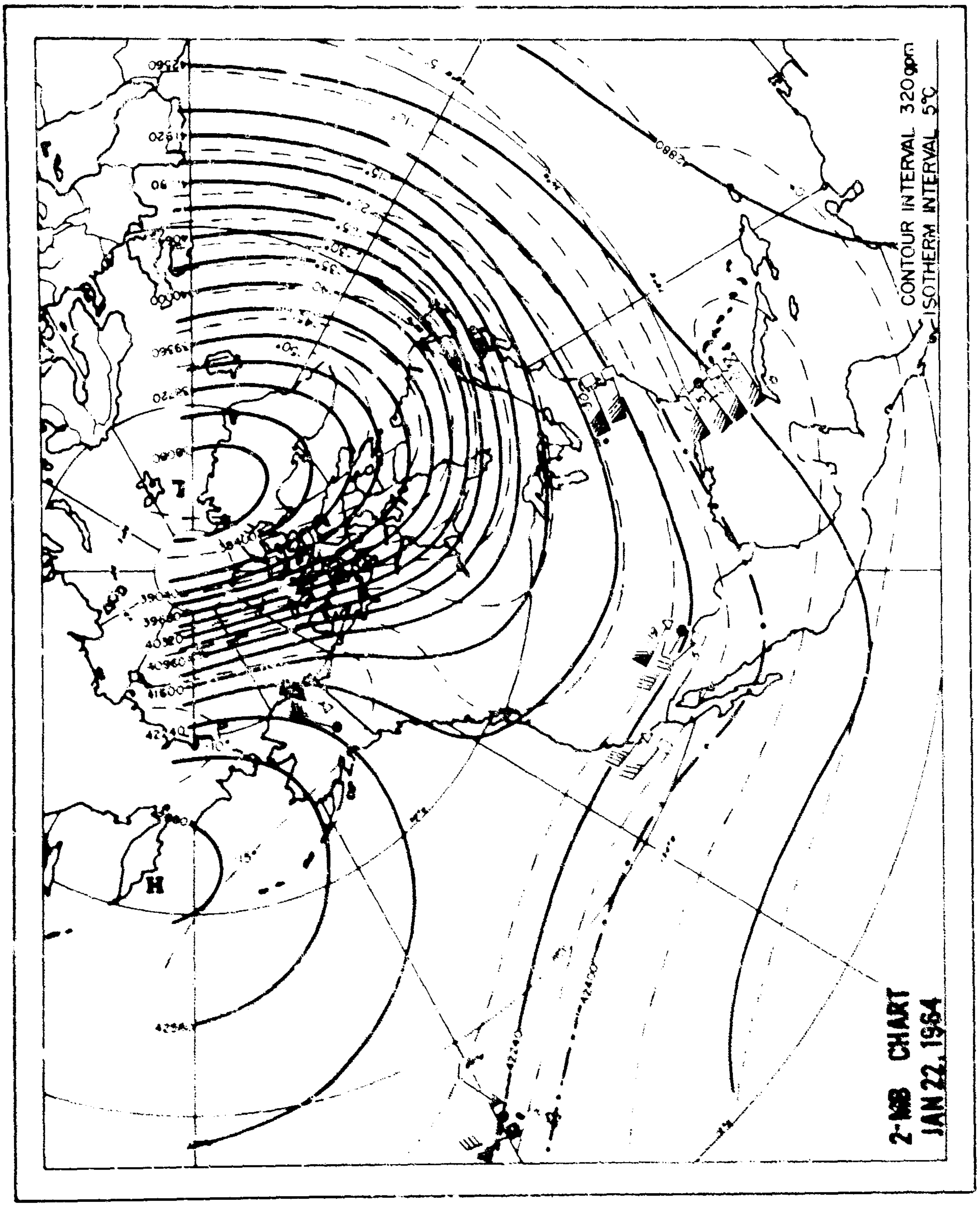


5-MB CHART
JAN 15, 1964


2-MB CHART
JAN 15, 1964
CONTOUR INTERVAL 320 gpm
ISOTHERM INTERVAL 5°C


0.4-MB CHART
JAN 15, 1964
CONTOUR INTERVAL 320
ISOTHERM INTERVAL 5°C


5-MB CHART
JAN 22, 1964
CONTOUR INTERVAL 320gpm
ISOTHERM INTERVAL 5°C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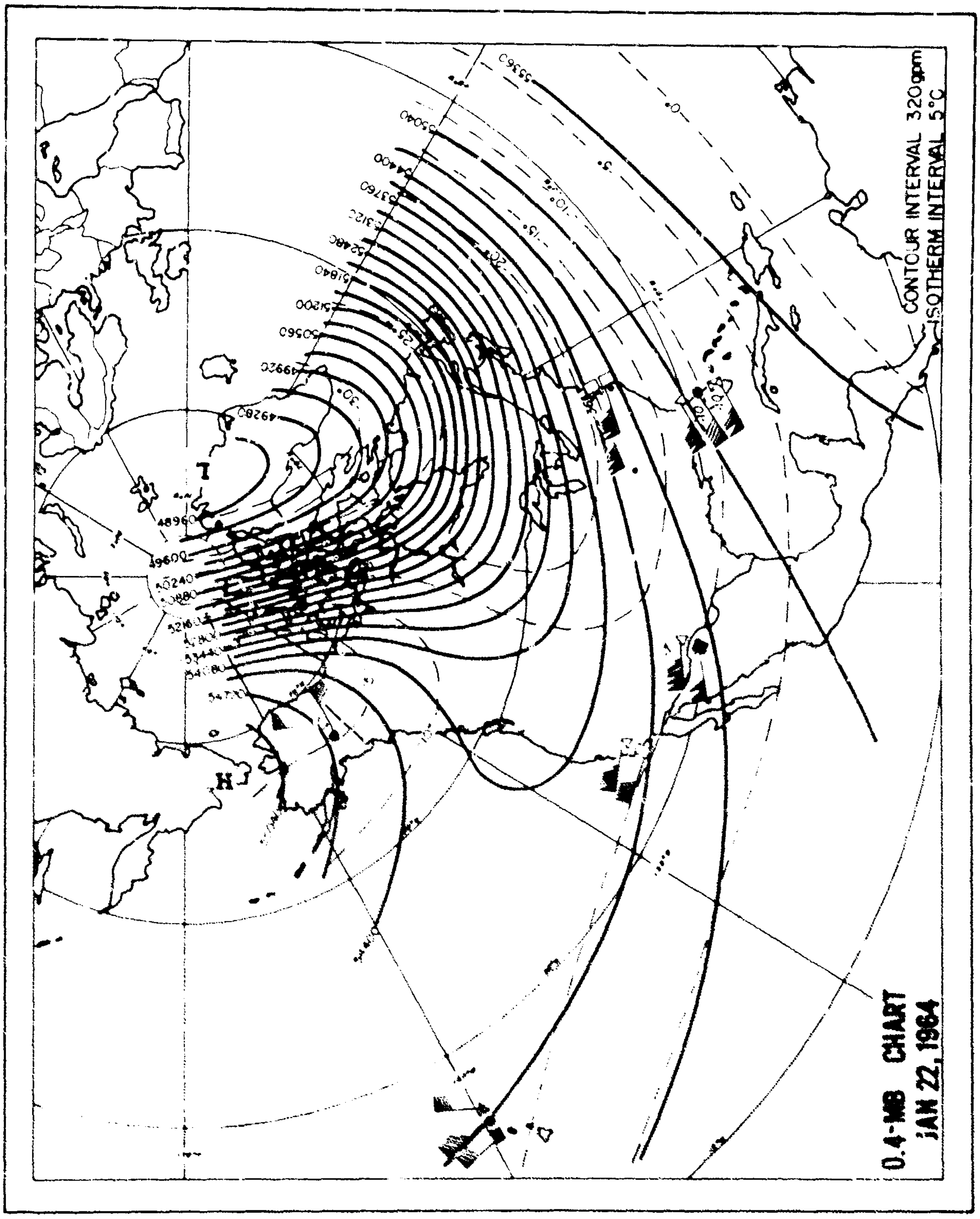
JAN 22, 1964
CONTOUR INTERVAL 320 gpm
ISOTHERM INTERVAL 5°C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JAN 22, 1964
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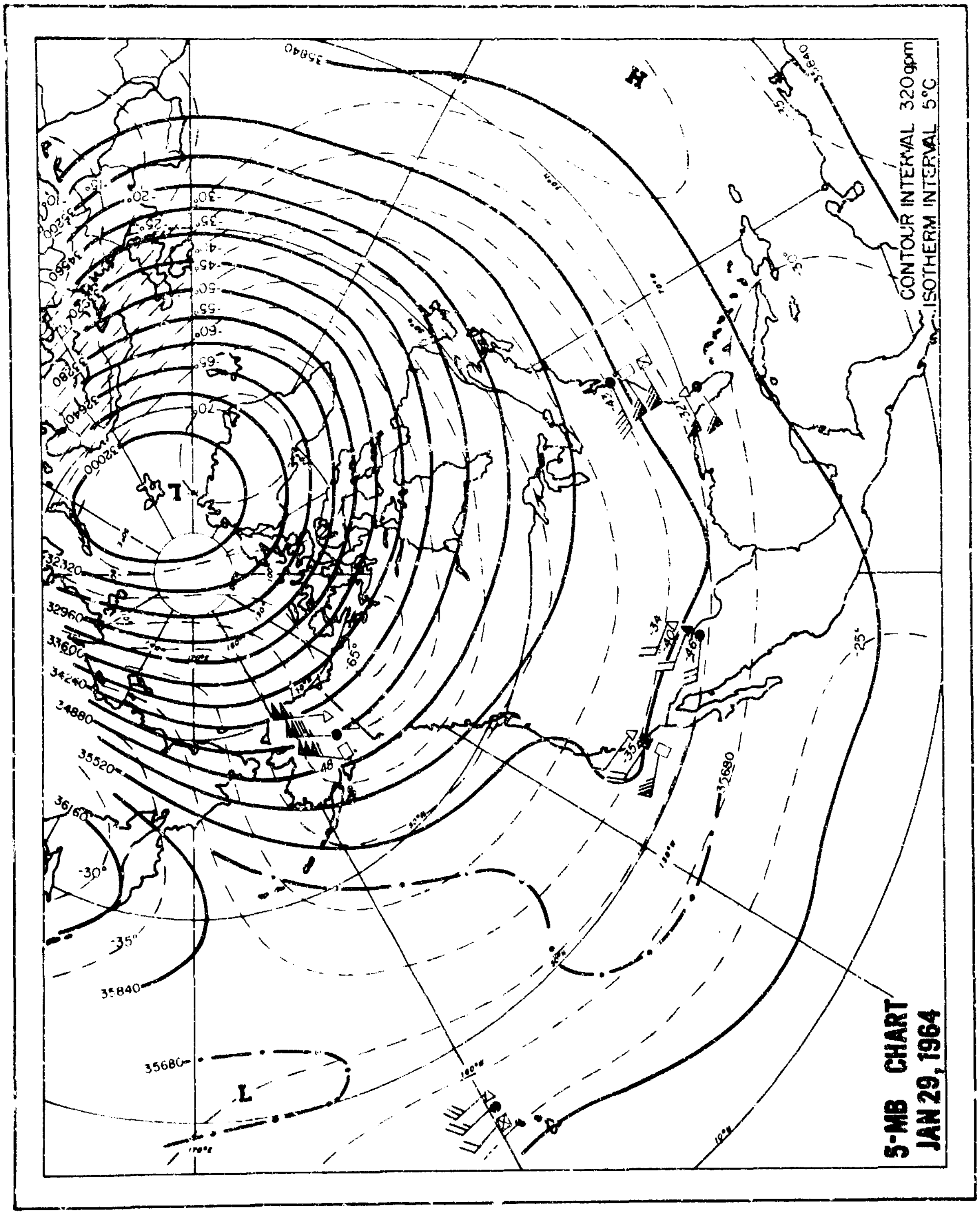
ISOTHERM INTERVAL 5°C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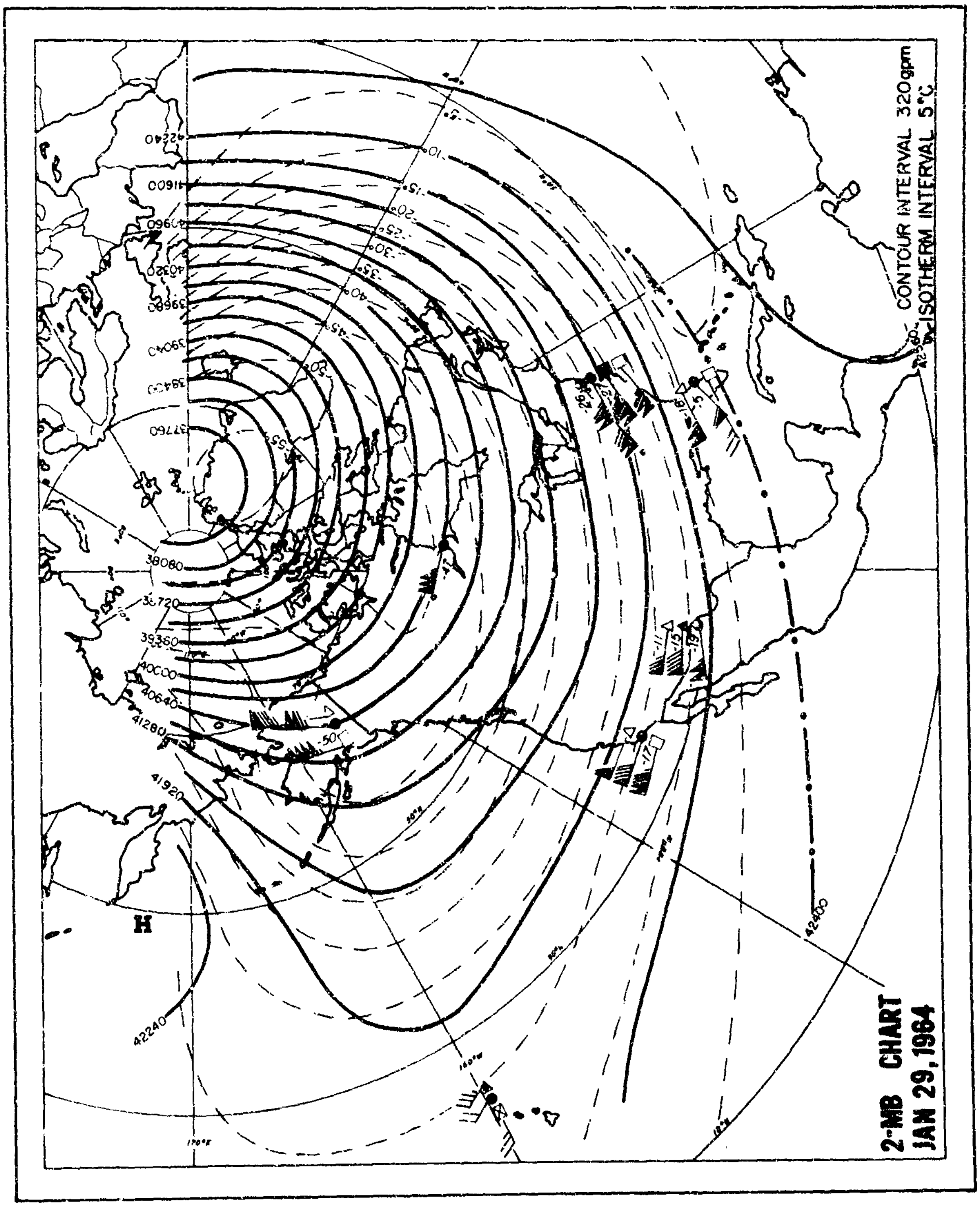
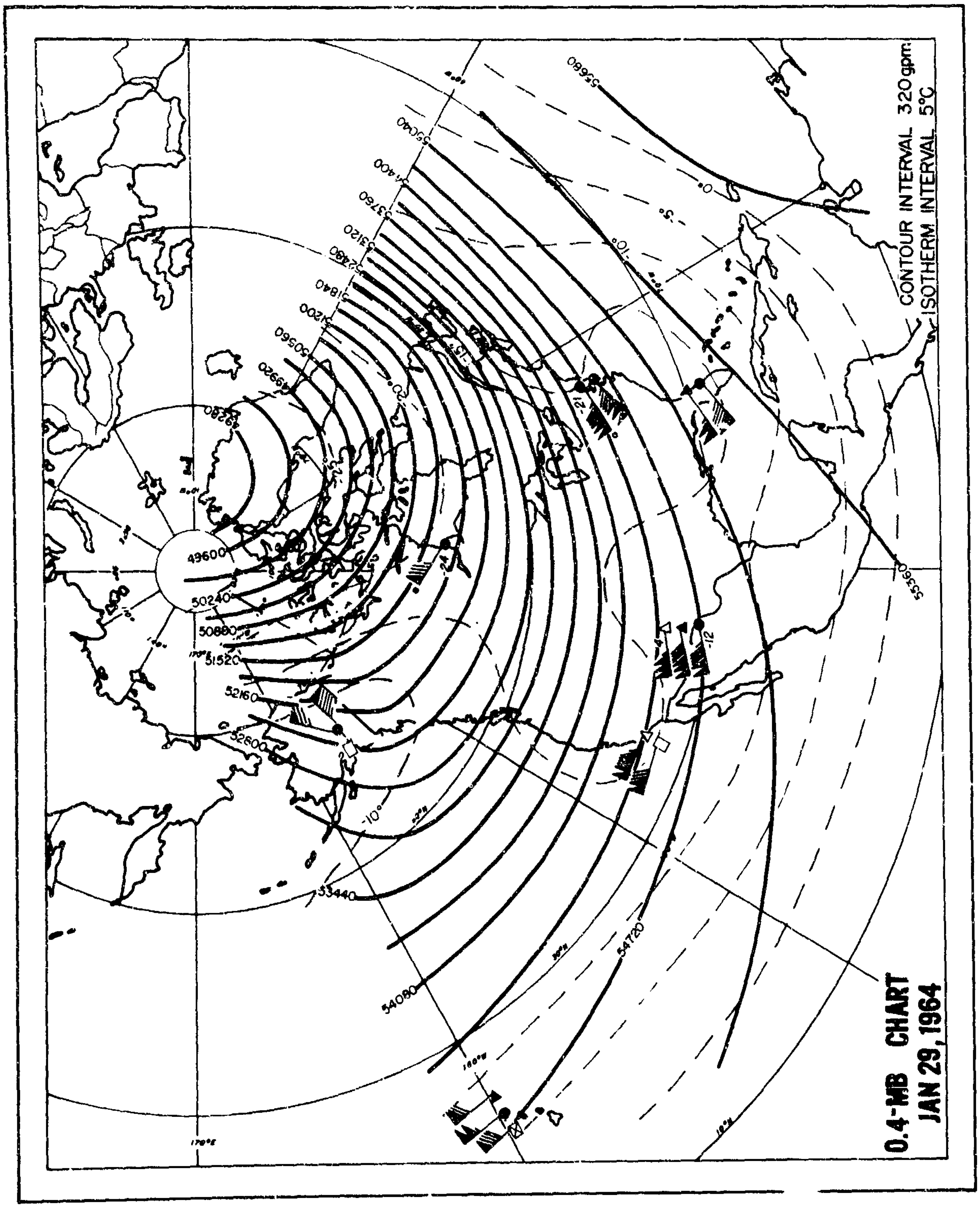
JAN 29, 1964
CONTOUR INTERVAL 320 gpm
ISOTHERM INTERVAL 5°C


CONTOUR INTERVAL 320gpm
ISOTHERM INTERVAL 5°C
2-MB CHART
JAN 29,1964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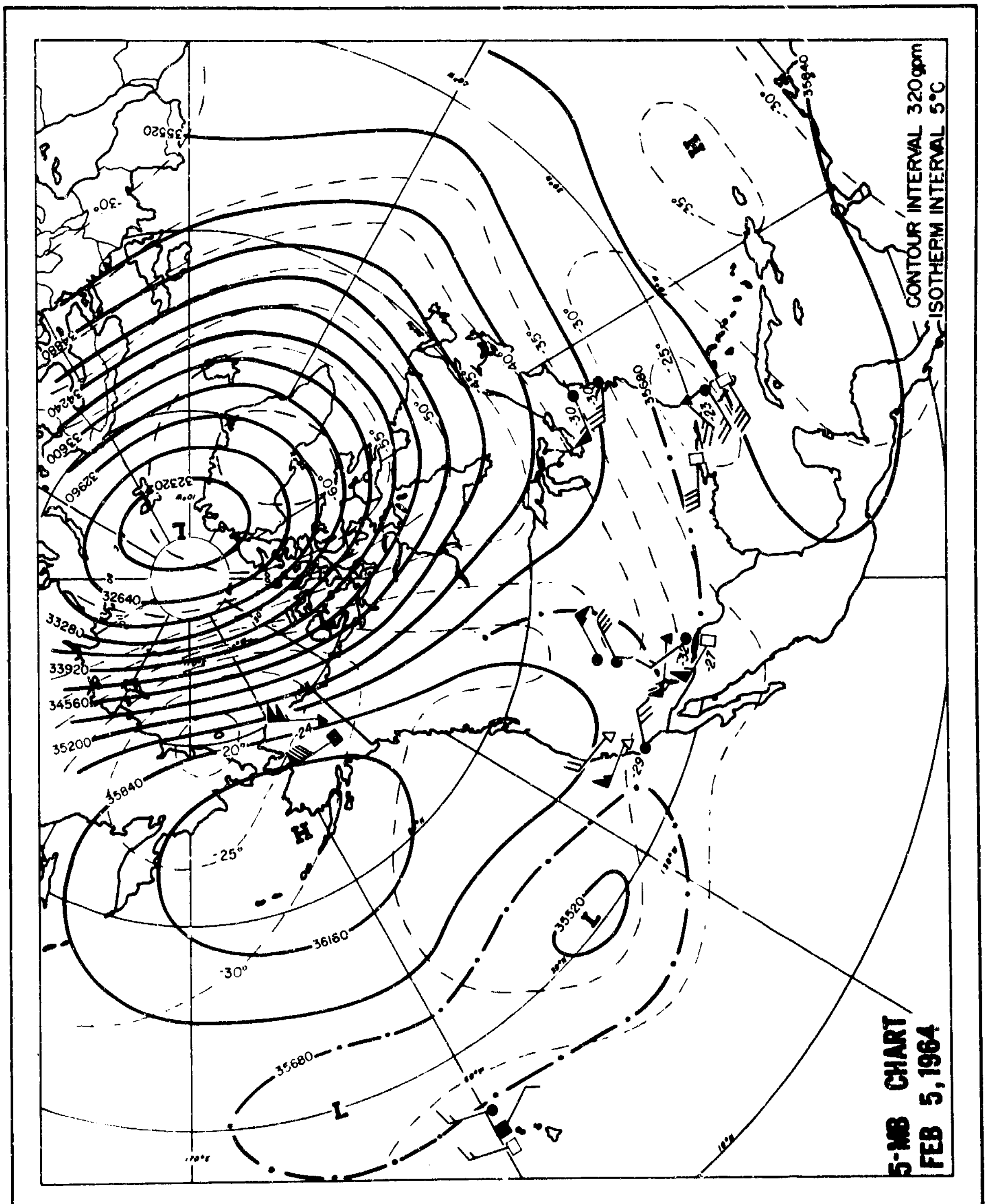
JAN 29, 1964
CONTOUR INTERVAL 320 gpm
ISOTHERM INTERVAL 5°C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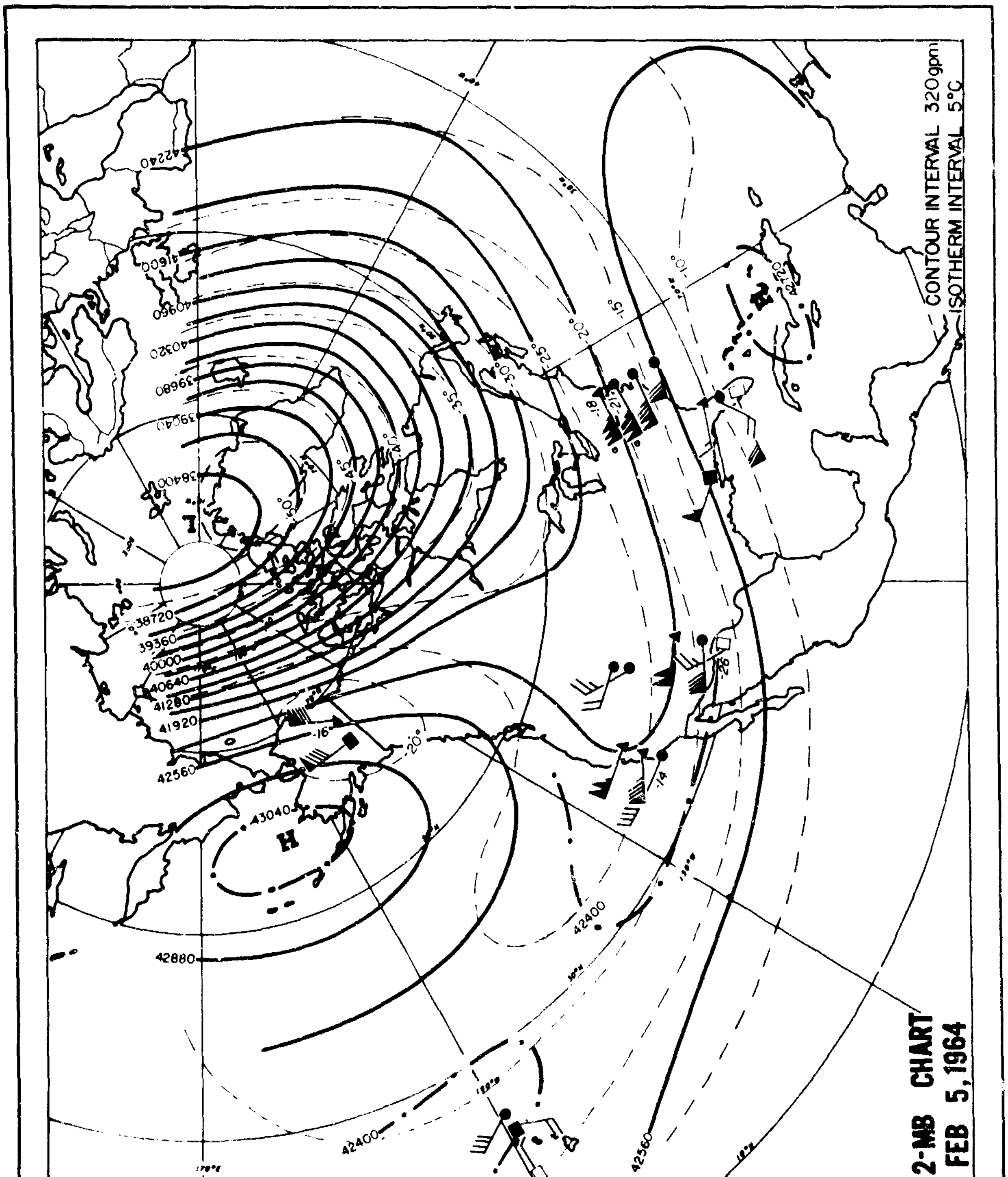
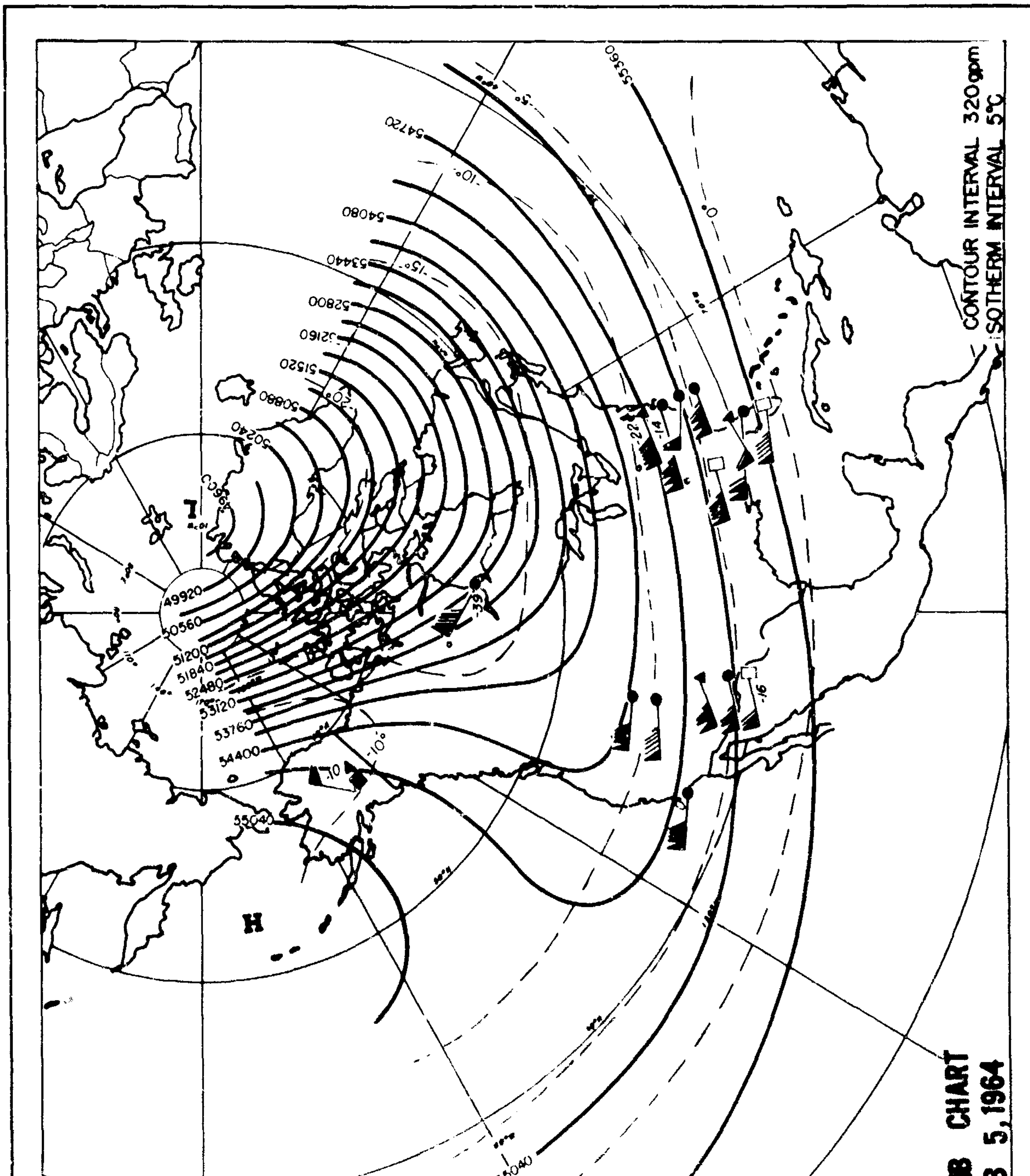
FEB 5, 1964
CONTOUR INTERVAL 320 gpm
ISOTHERM INTERVAL 5°C


2-MB CHART
FEB 5, 1964
CONTOUR INTERVAL 320gpm
ISOTHERM INTERVAL 5°C
38720
39360
40000
40640
41280
41920
42560
42880
43040
42400
42240
H
L


0.4-MB CHART
FEB 5, 1964
CONTOUR INTERVAL 320gpm
ISOTHERM INTERVAL 5°C
49920
50560
51200
51840
52480
53120
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55040
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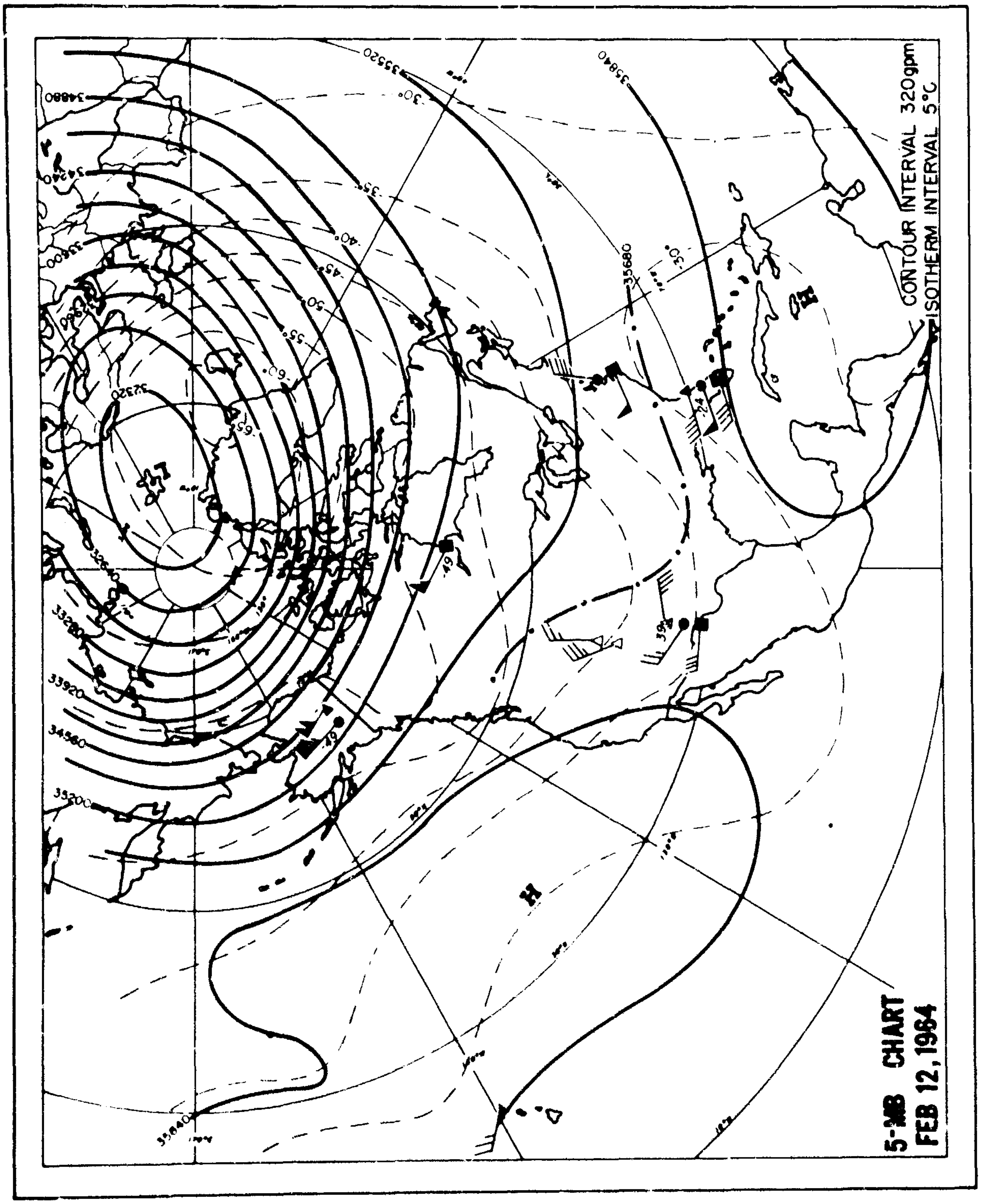
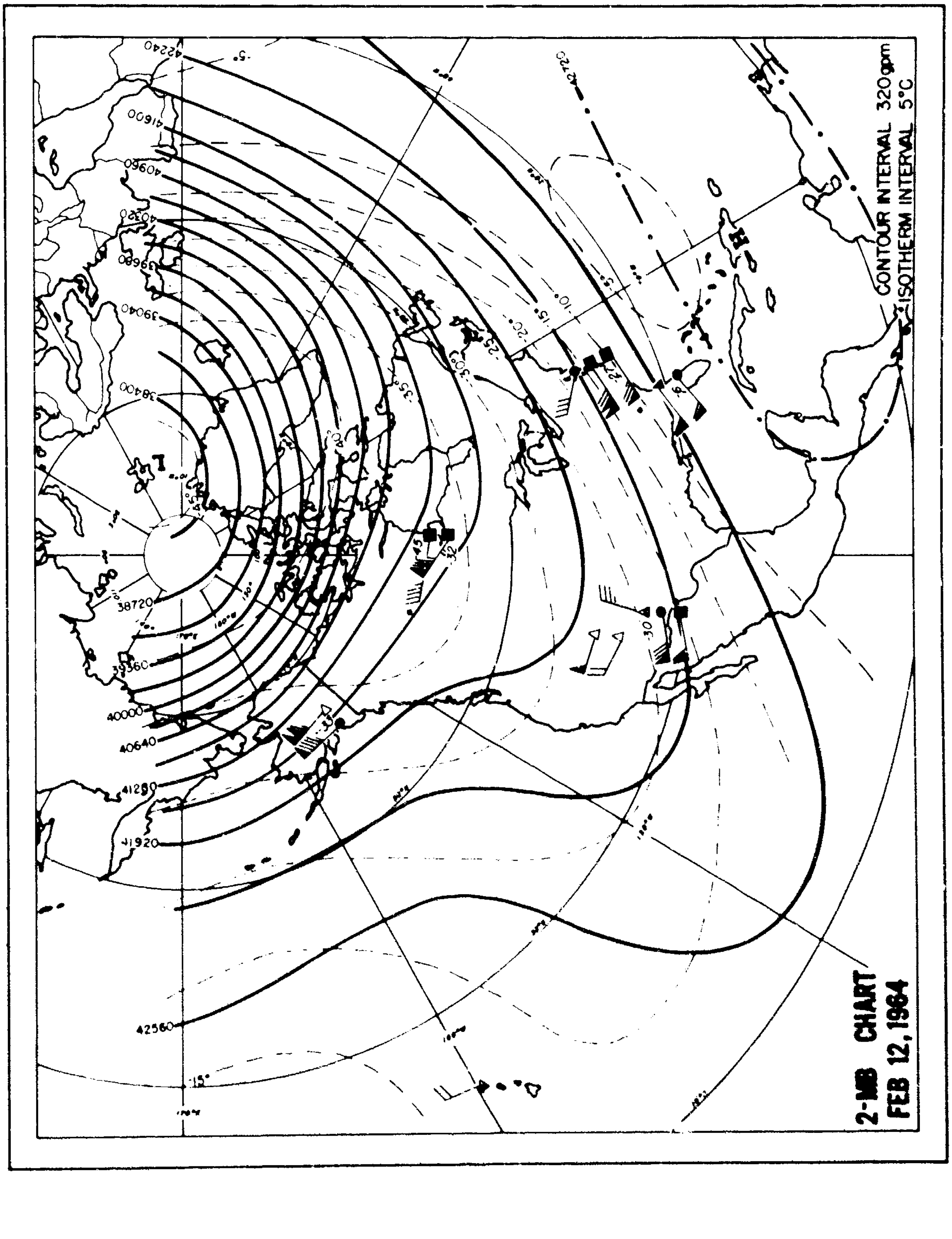
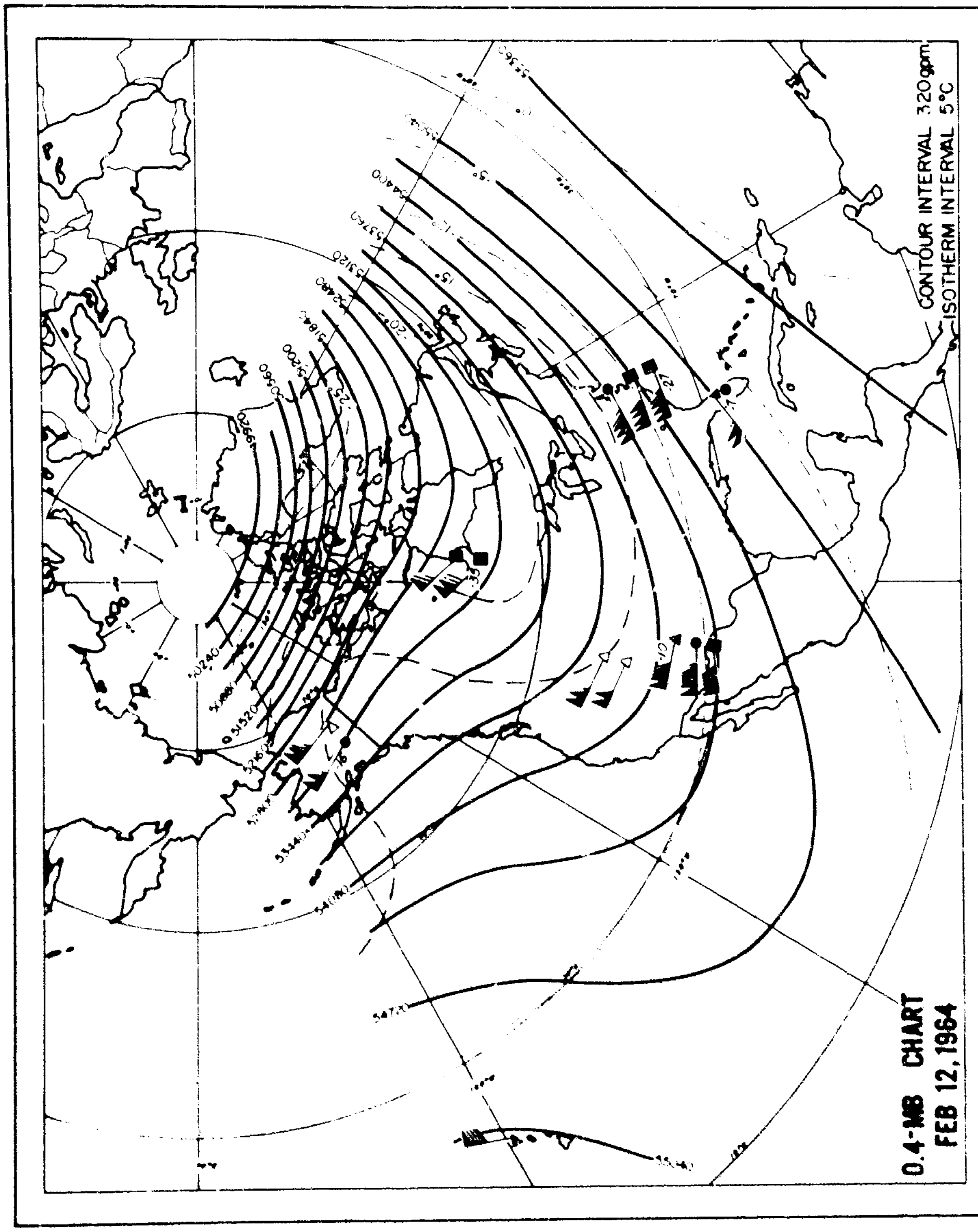
51520
52160
52800
53440
54080
54720
55360
H
L


5-MB CHART
FEB 12, 1964
CONTOUR INTERVAL 320gpm
ISOTHERM INTERVAL 5°C


2-MB CHART
FEB 12, 1964
CONTOUR INTERVAL 320gpm
ISOTHERM INTERVAL 5°C
42240
41600
40960
40320
39680
39040
38400
38720
39360
40000
40640
41280
41920
42560
42720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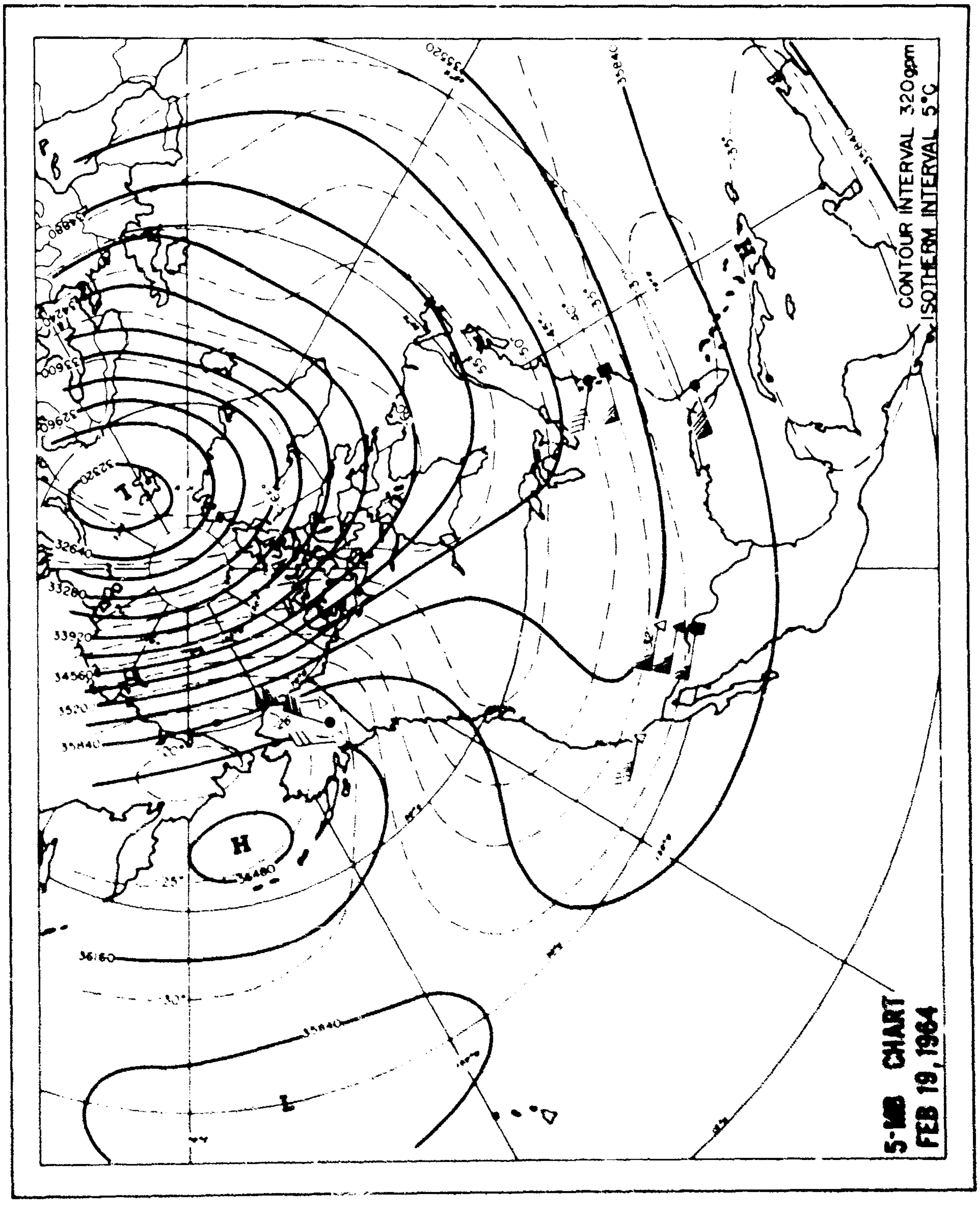
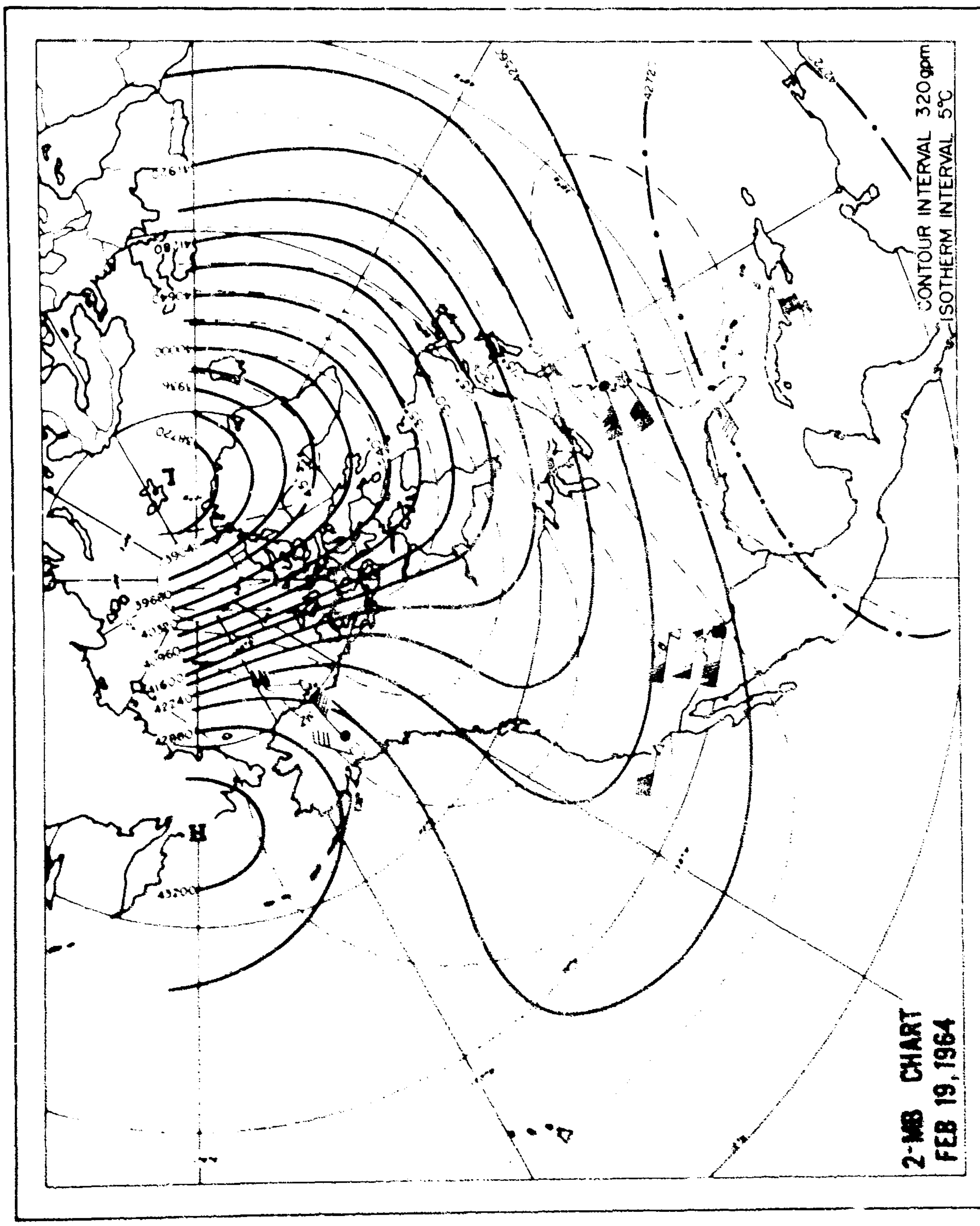
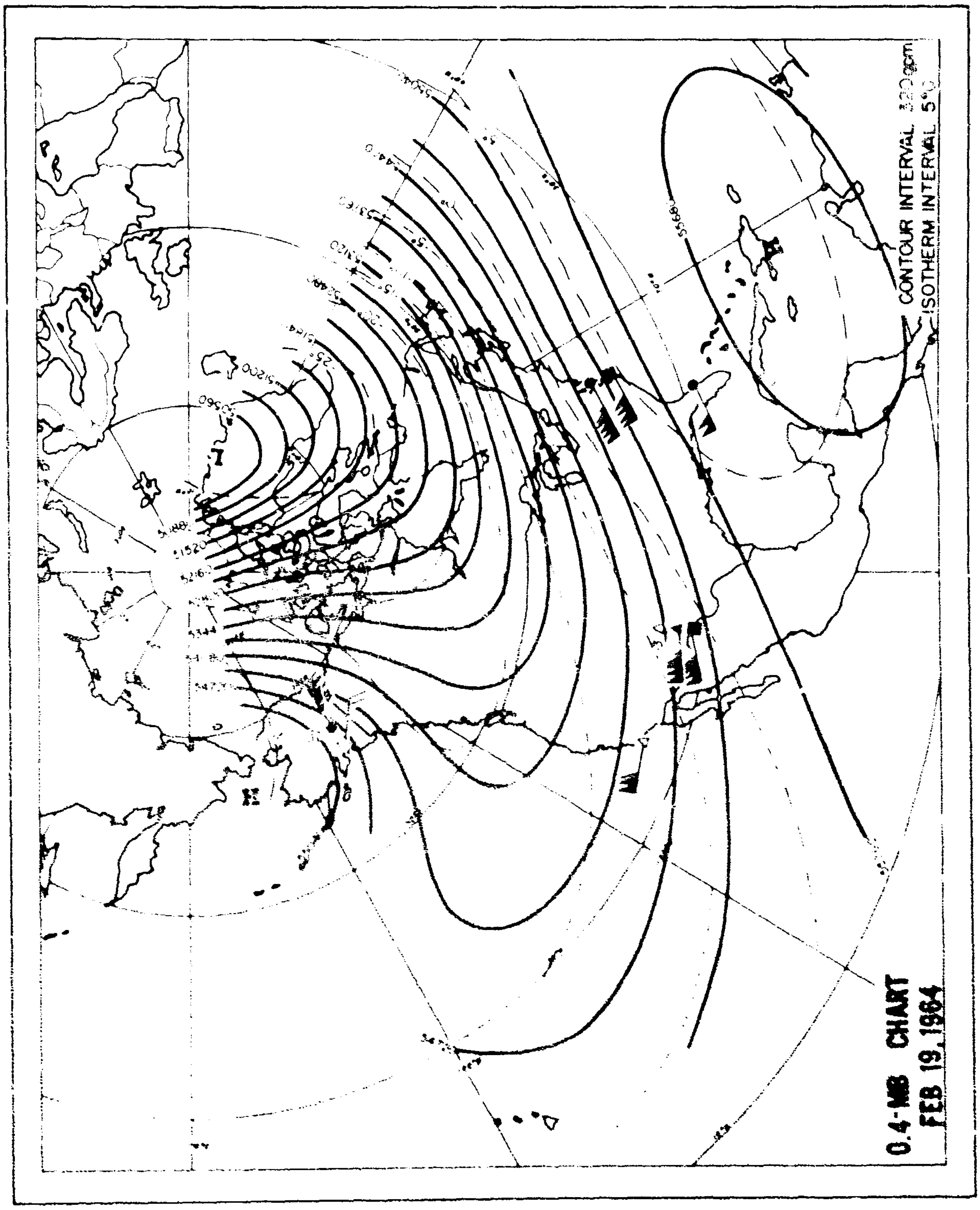
CONTOUR INTERVAL 320 gpm
ISOTHERM INTERVAL 5°C


5-MB CHART
FEB 19, 1964
CONTOUR INTERVAL 320gpm
ISOTHERM INTERVAL 5°C


2-MB CHART
FEB 19, 1964
CONTOUR INTERVAL 320 gpm
ISOTHERM INTERVAL 5°C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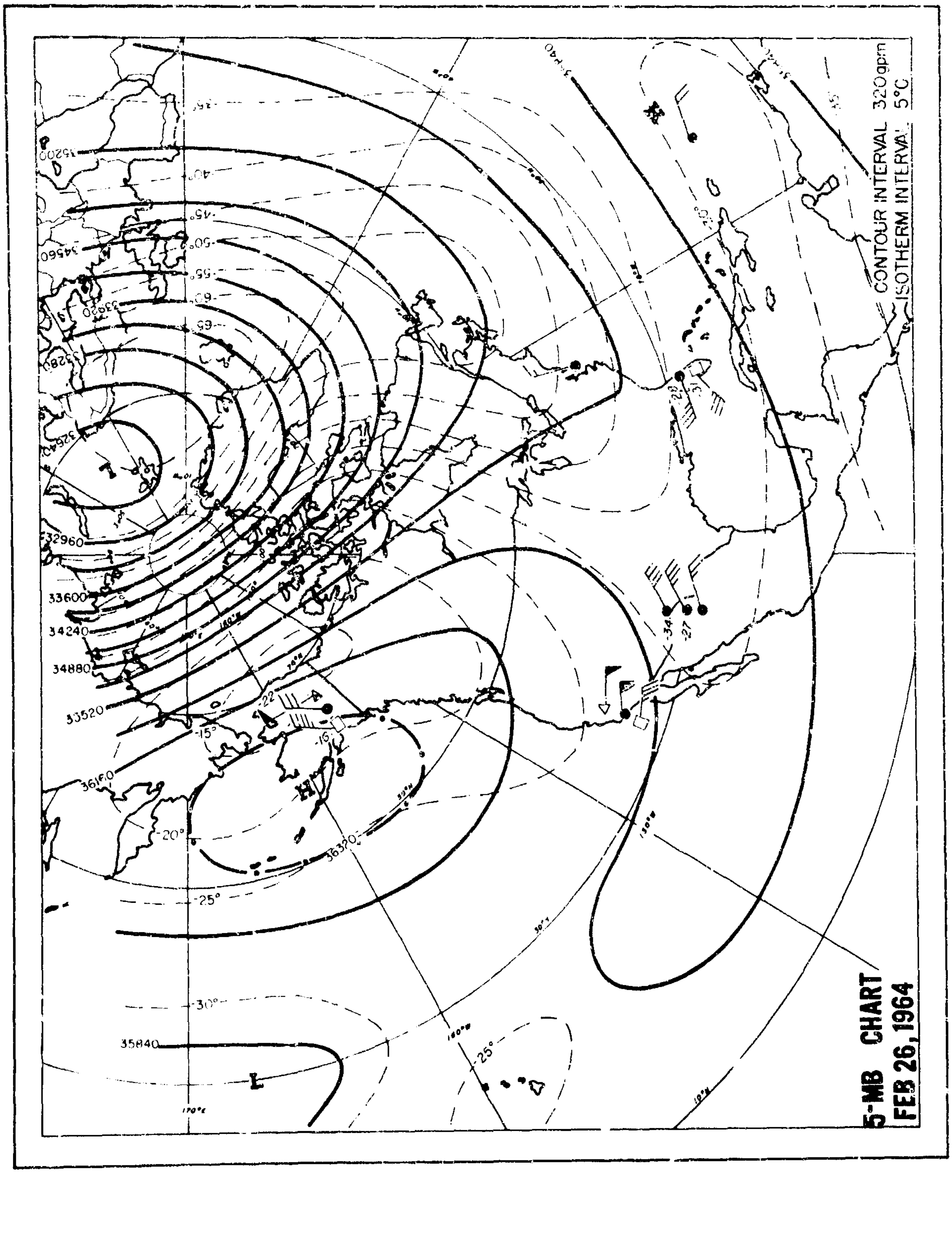
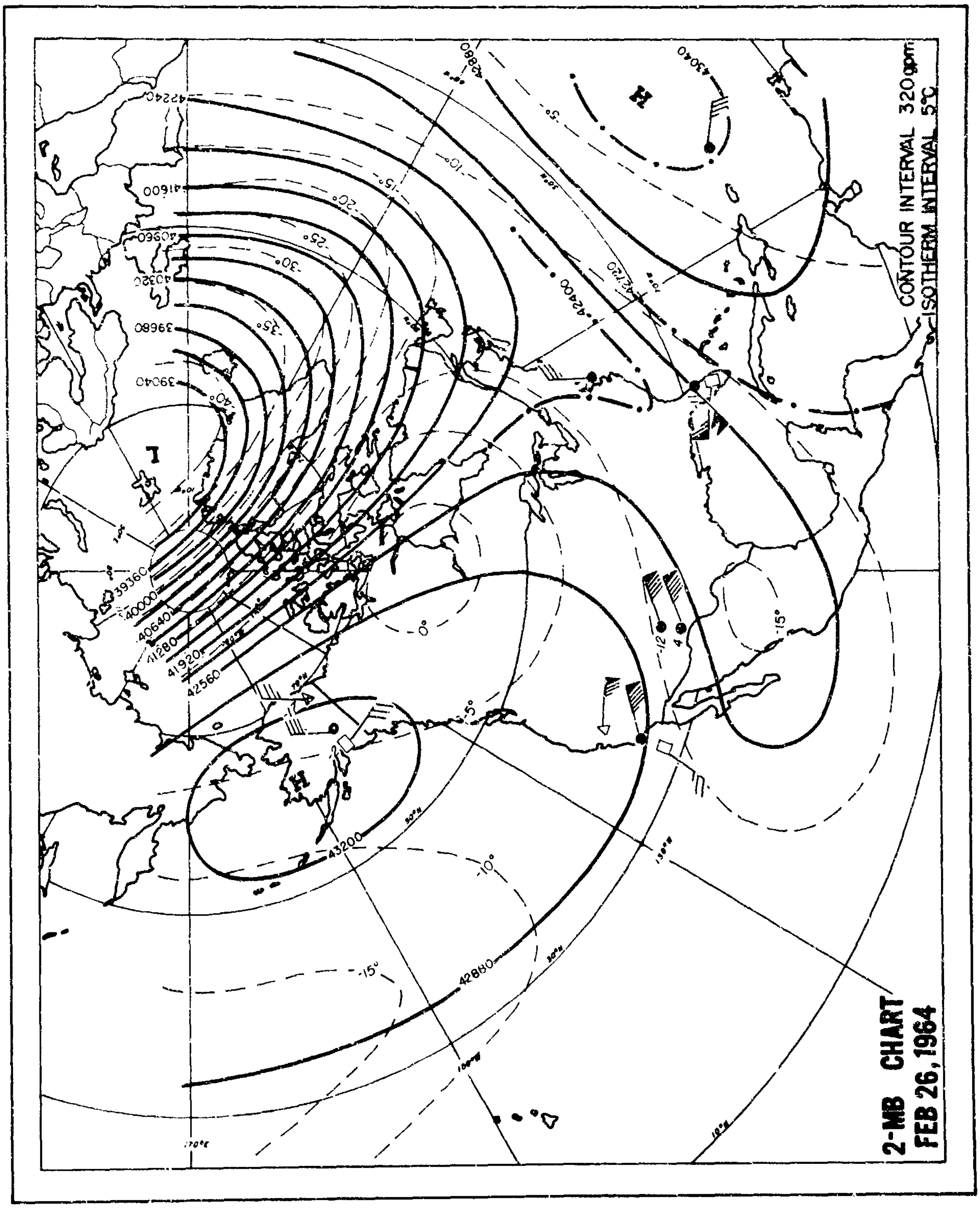
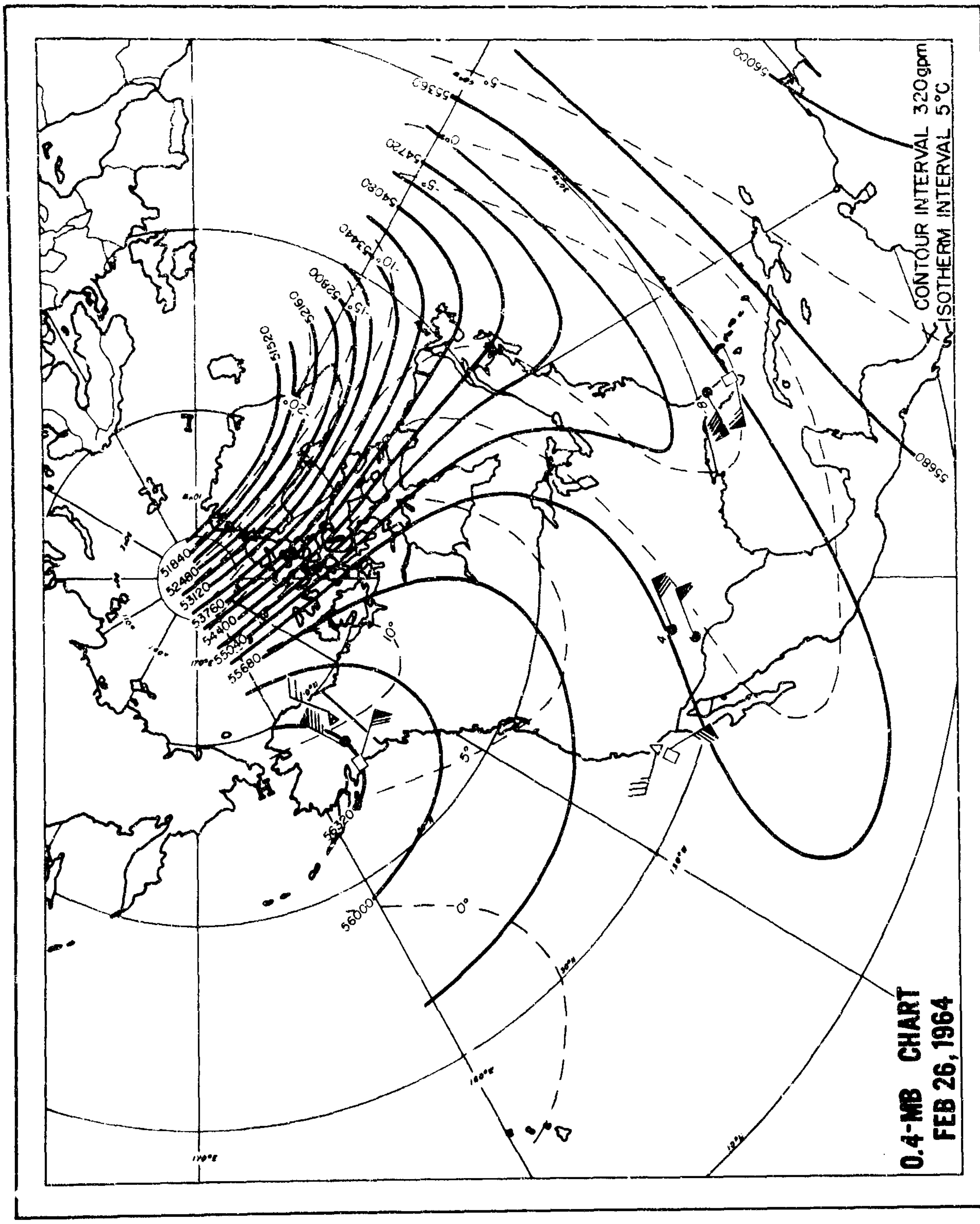
CONTOUR INTERVAL 320 gpm
ISOTHERM INTERVAL 5°C


5-MB CHART
FEB 26, 1964
CONTOUR INTERVAL 320 gpm
ISOTHERM INTERVAL 5°C


2-MB CHART
FEB 26, 1964
CONTOUR INTERVAL 320 gpm
ISOTHERM INTERVAL 5°C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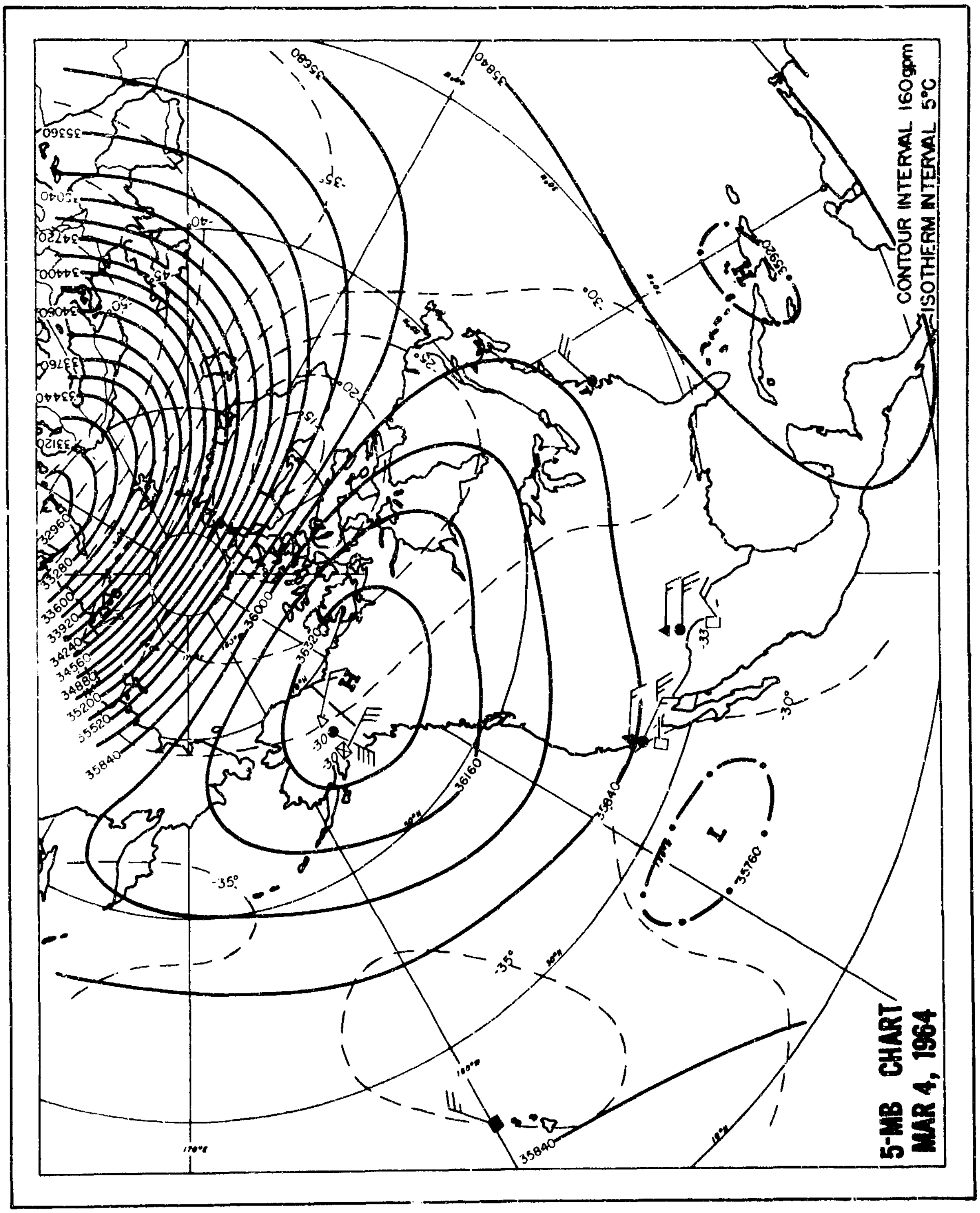
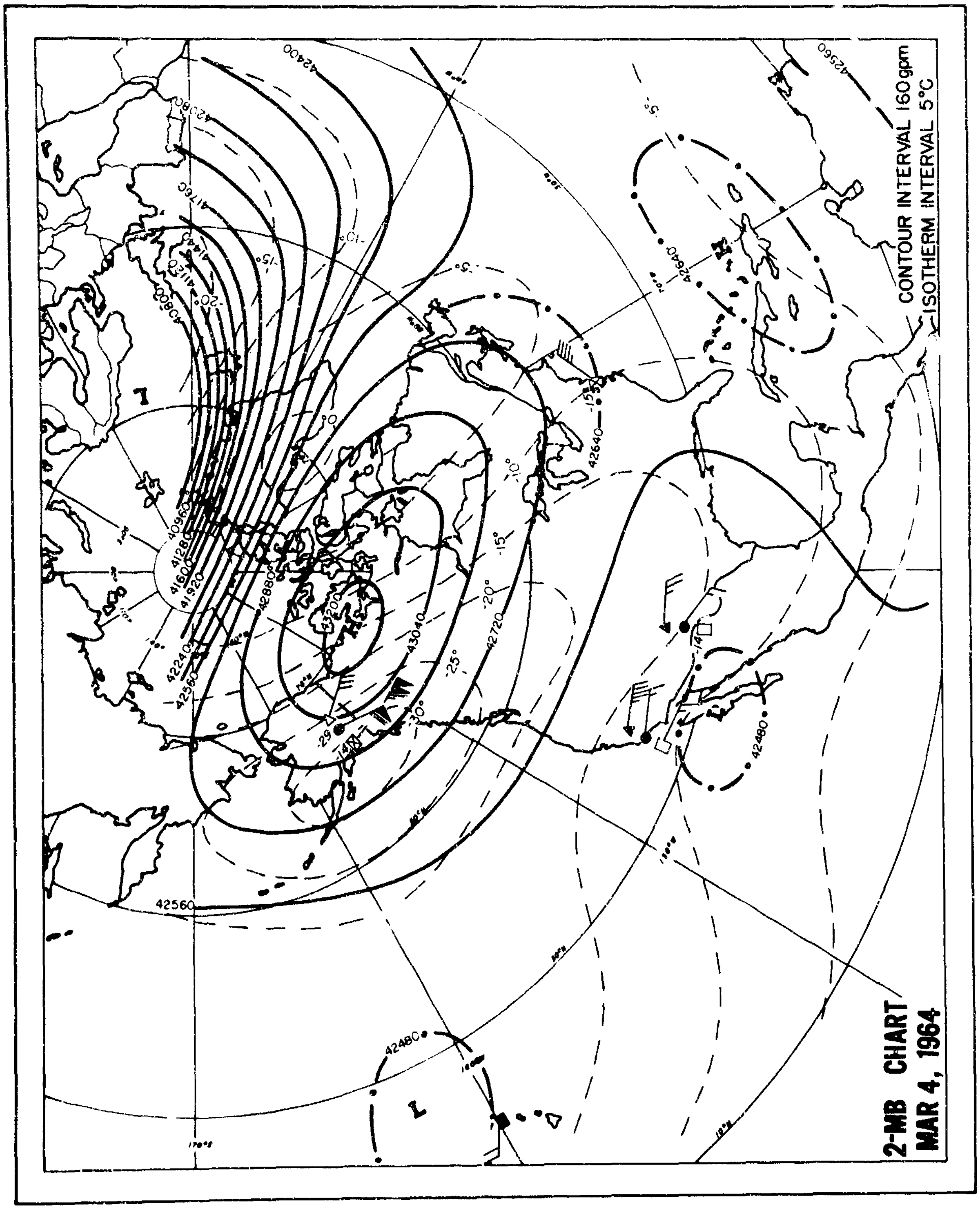
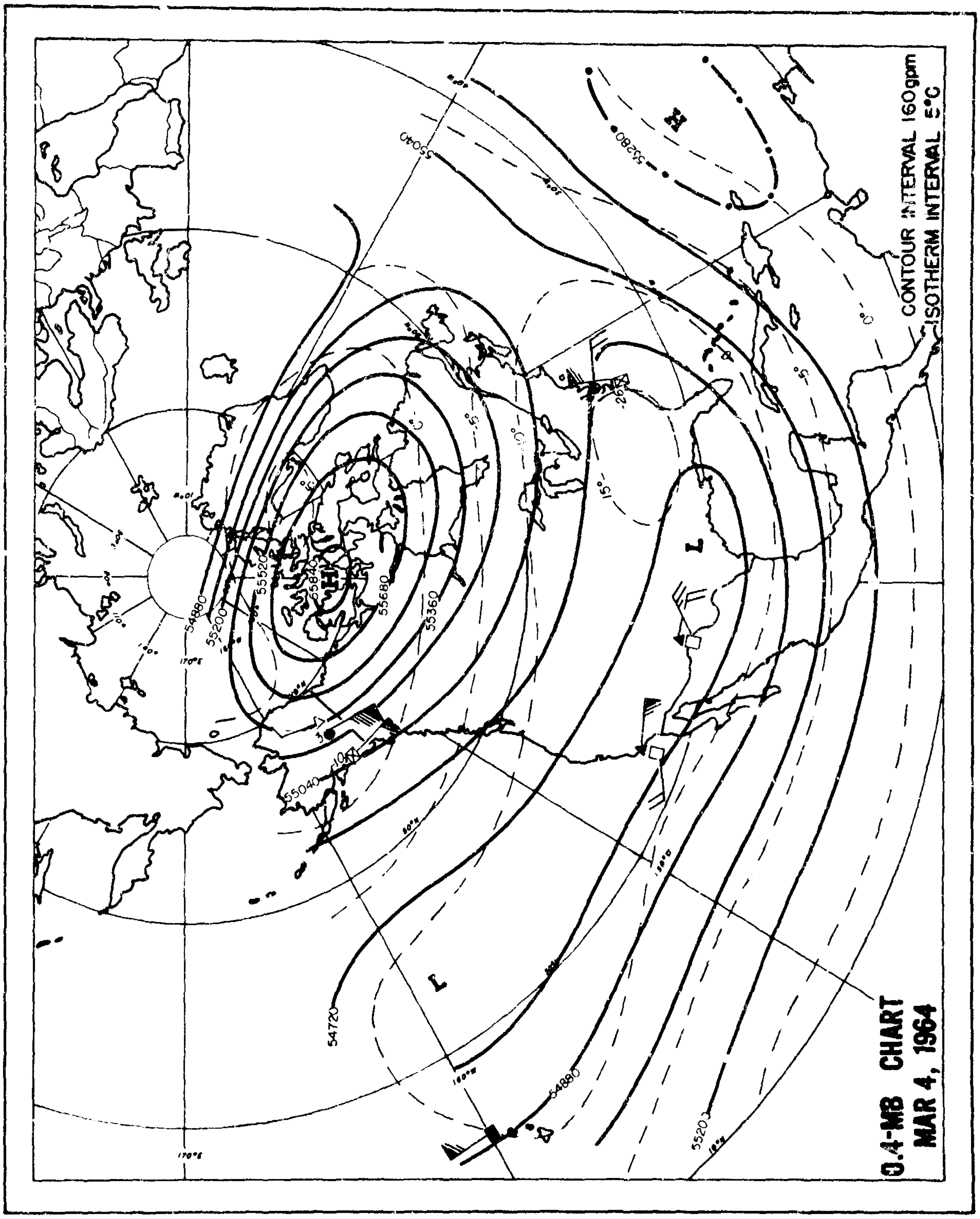
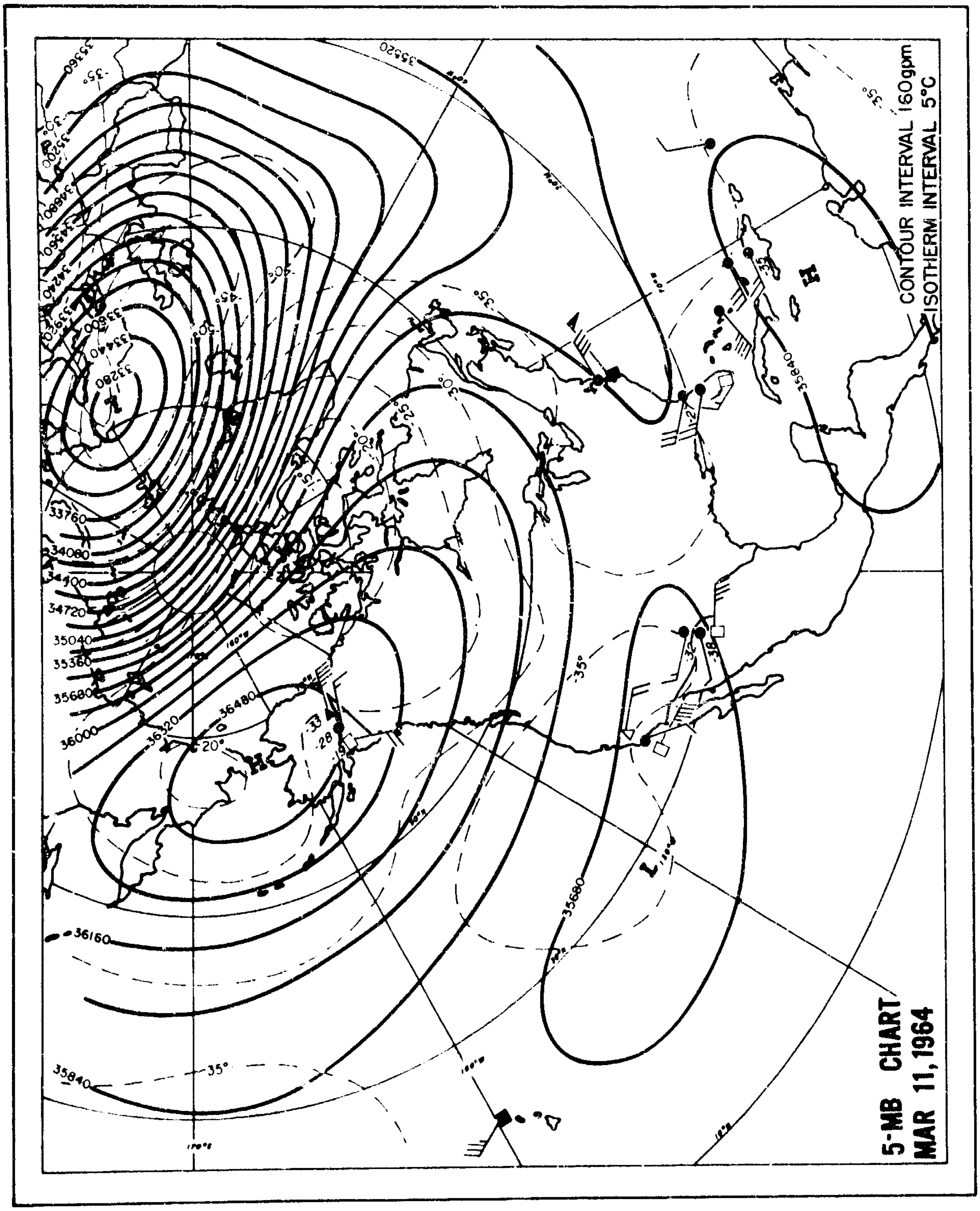
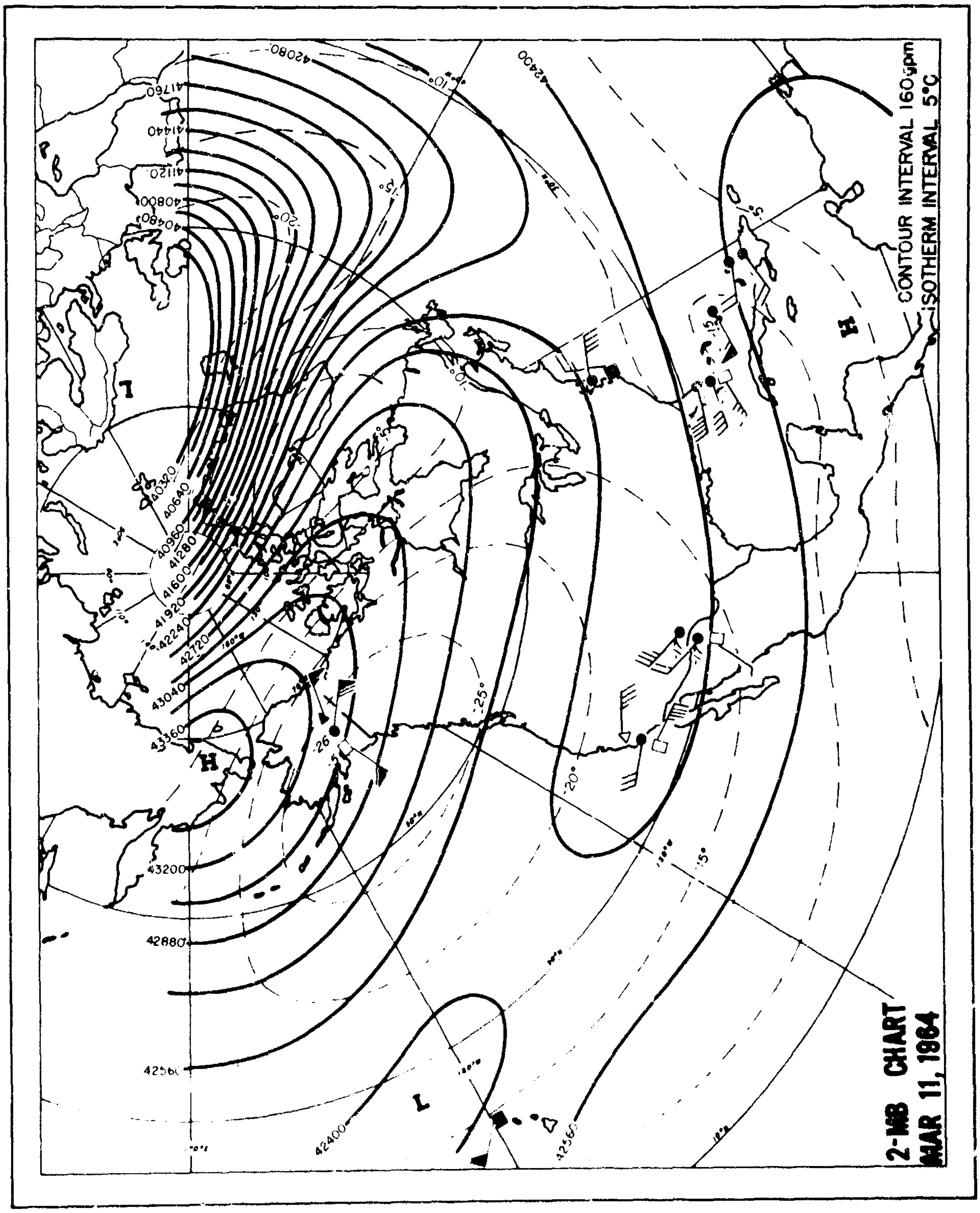
FEB 26, 1964
CONTOUR INTERVAL 320 gpm
ISOTHERM INTERVAL 5°C

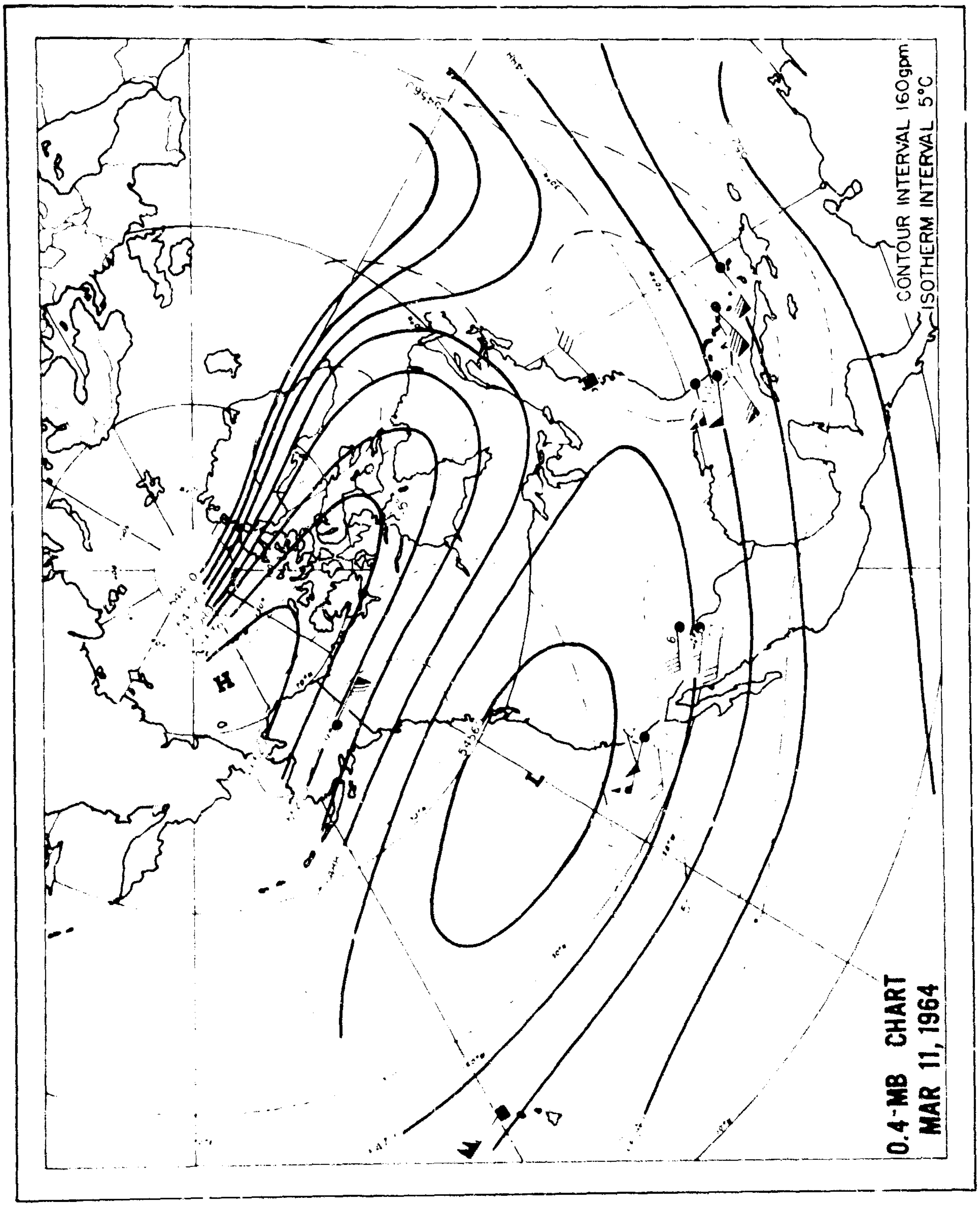

5-MB CHART
MAR 4, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C

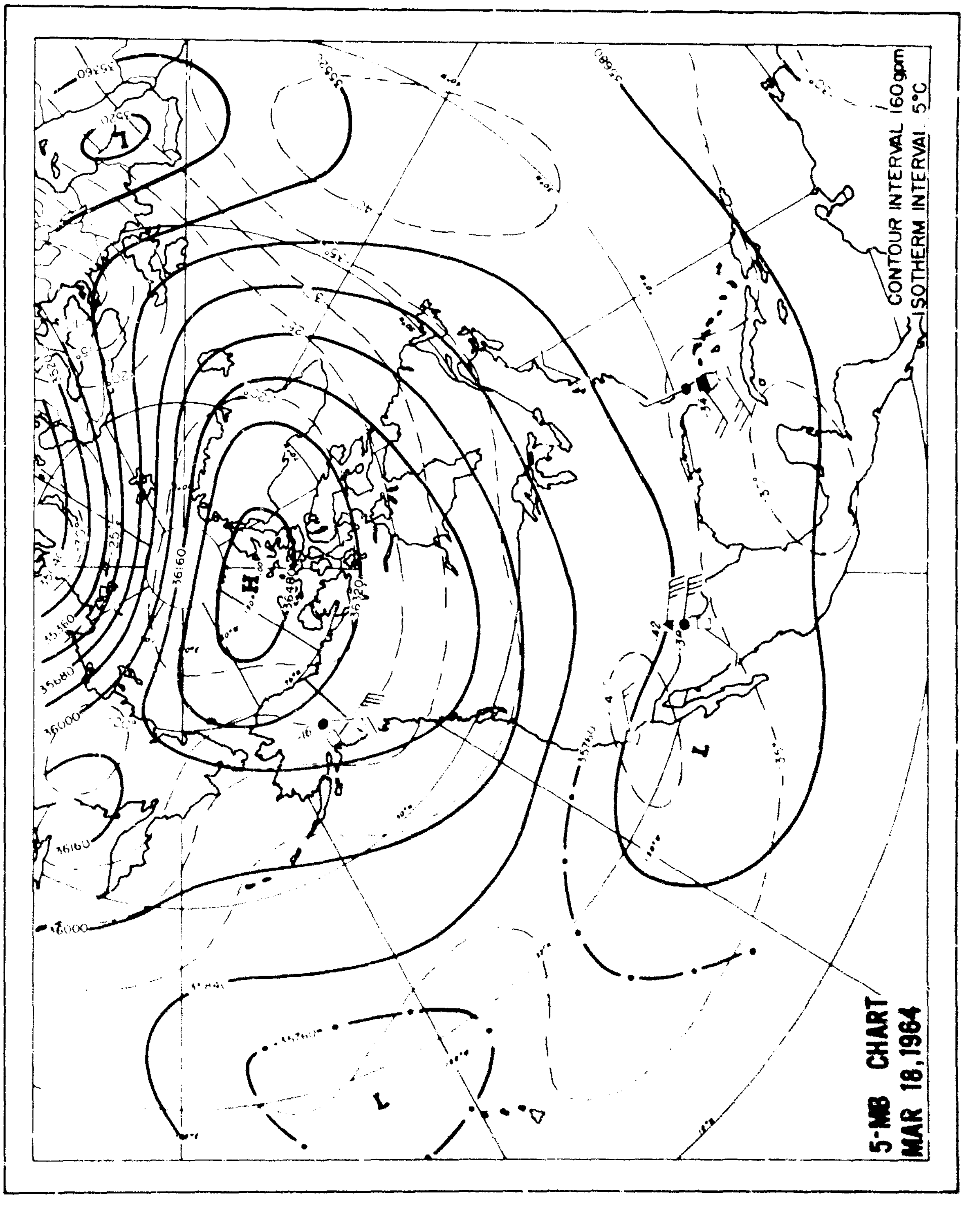

2-MB CHART
MAR 4, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C

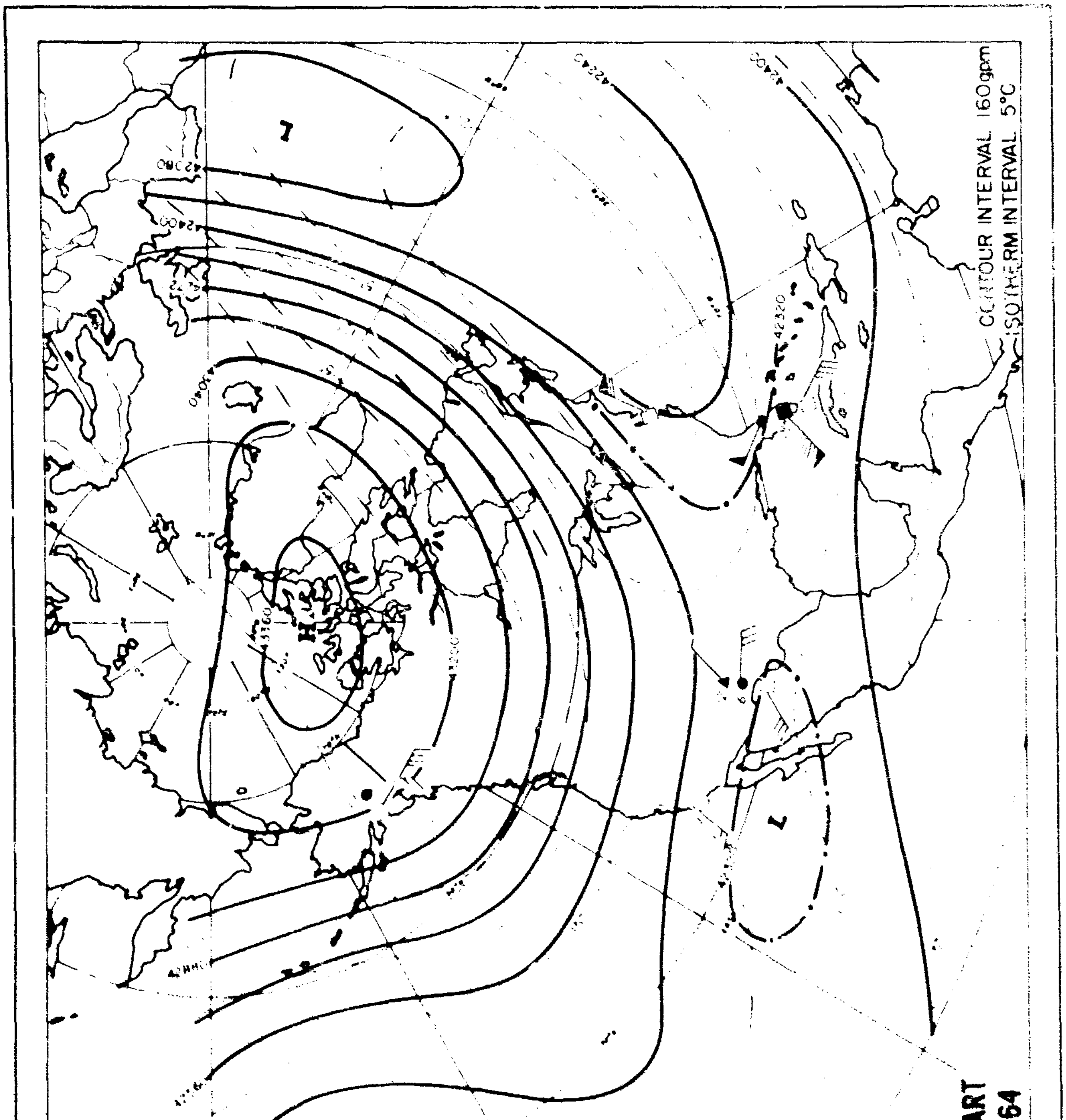

0.4-MB CHART
MAR 4, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
55040
55280
H
54880
55200
55520
55840
H
55680
55360
55040
L
L
54720
54880
55200

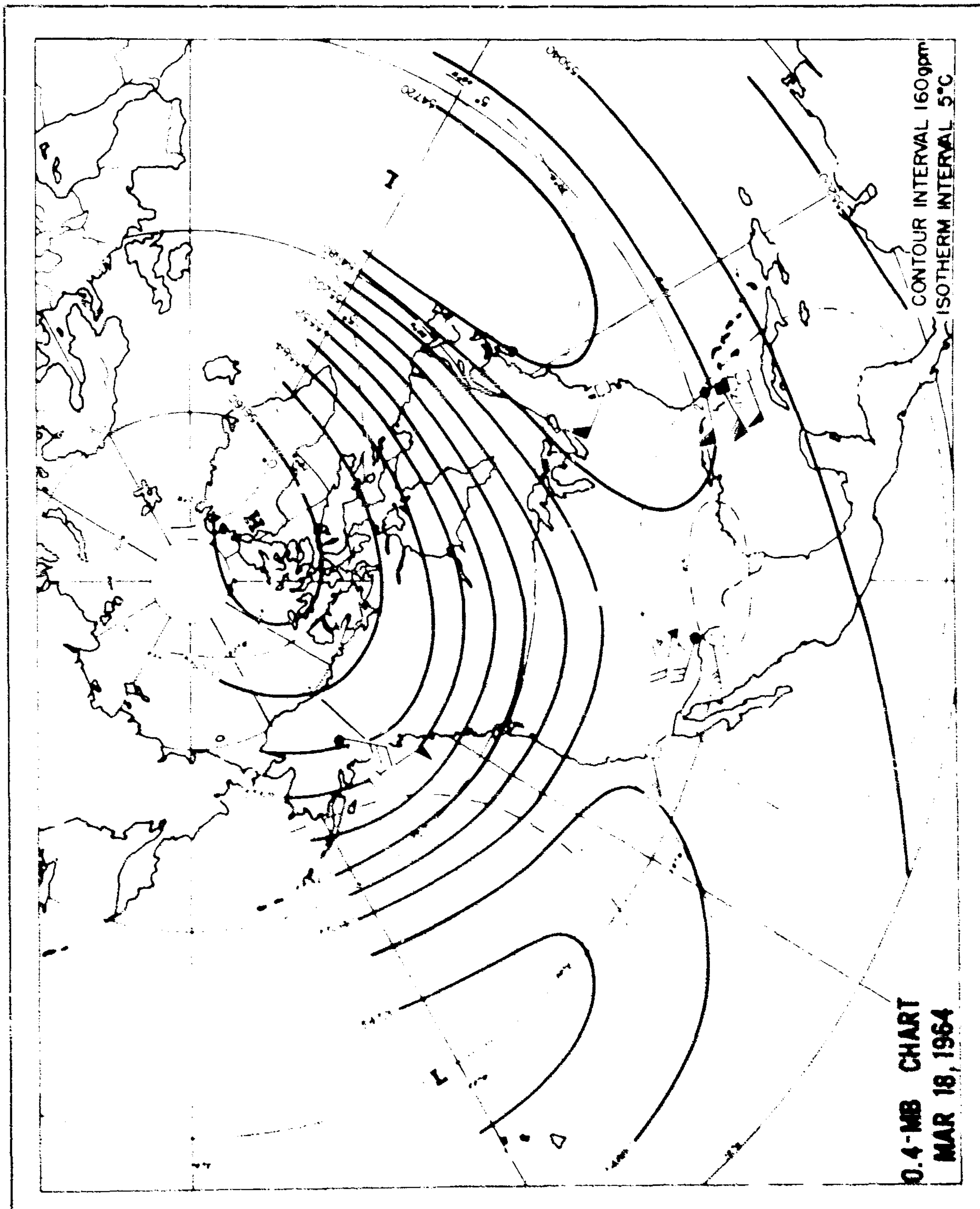

5-MB CHART
MAR 11, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C

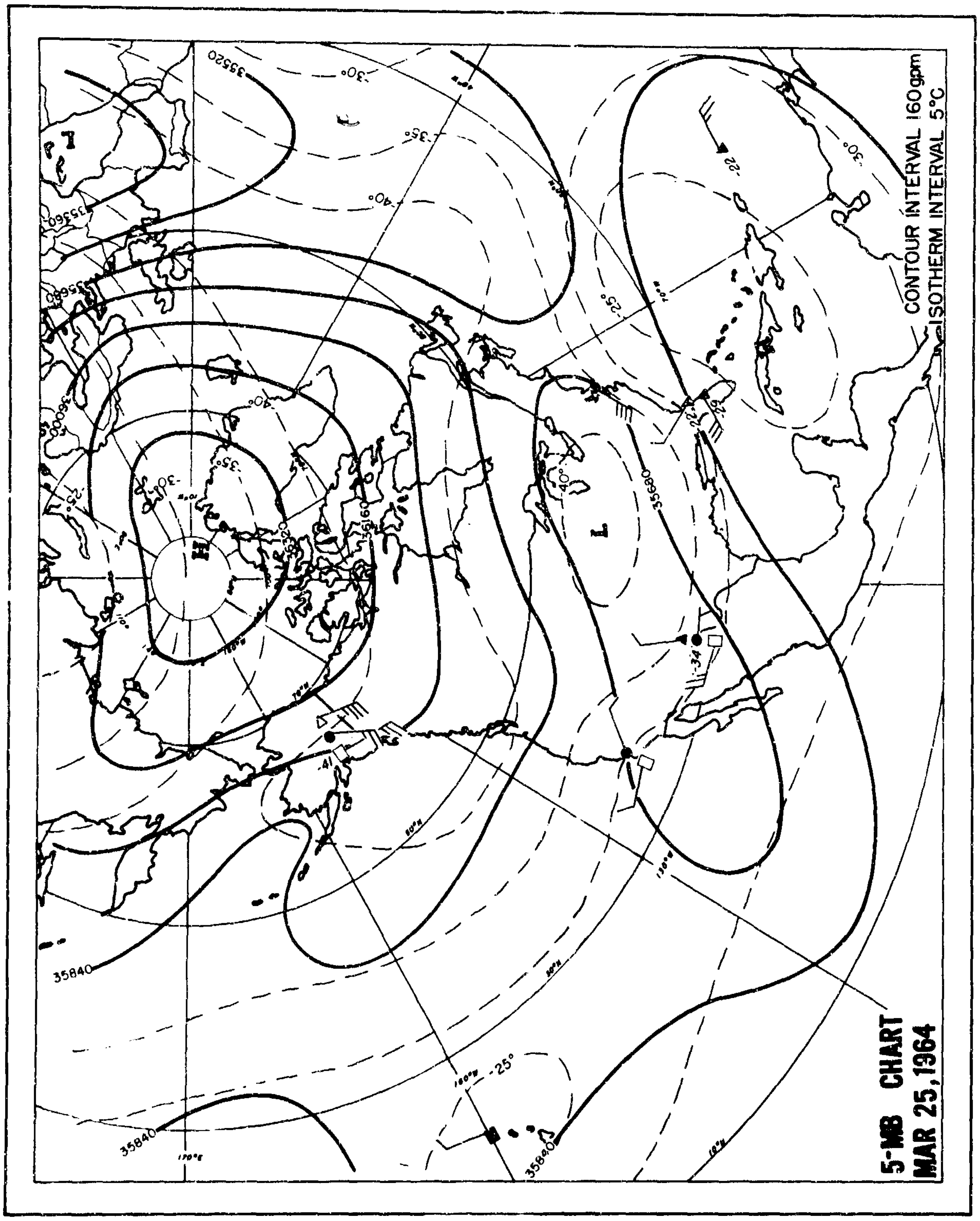

2-MB CHART
MAR 11, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C

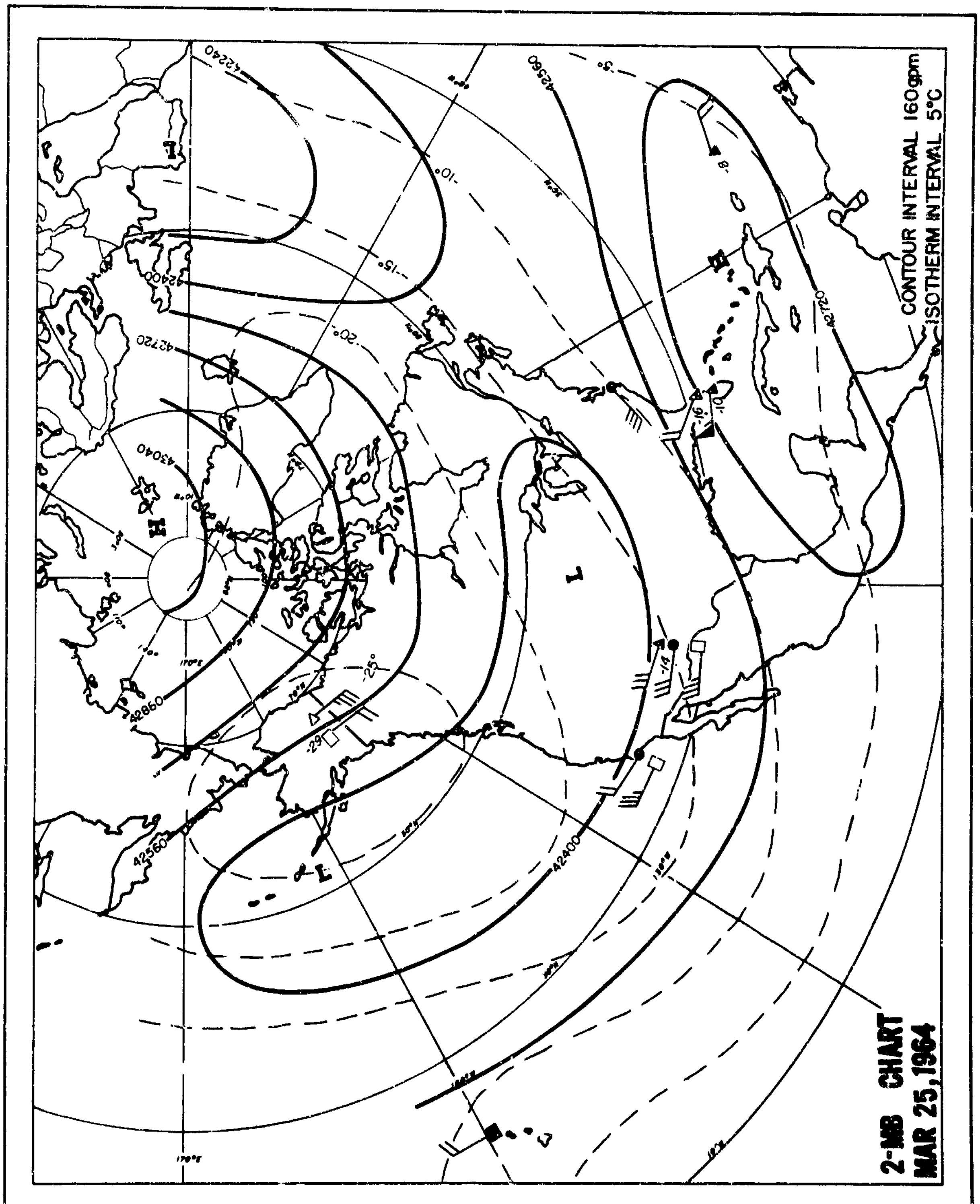

0.4-MB CHART
MAR 11, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
H
L

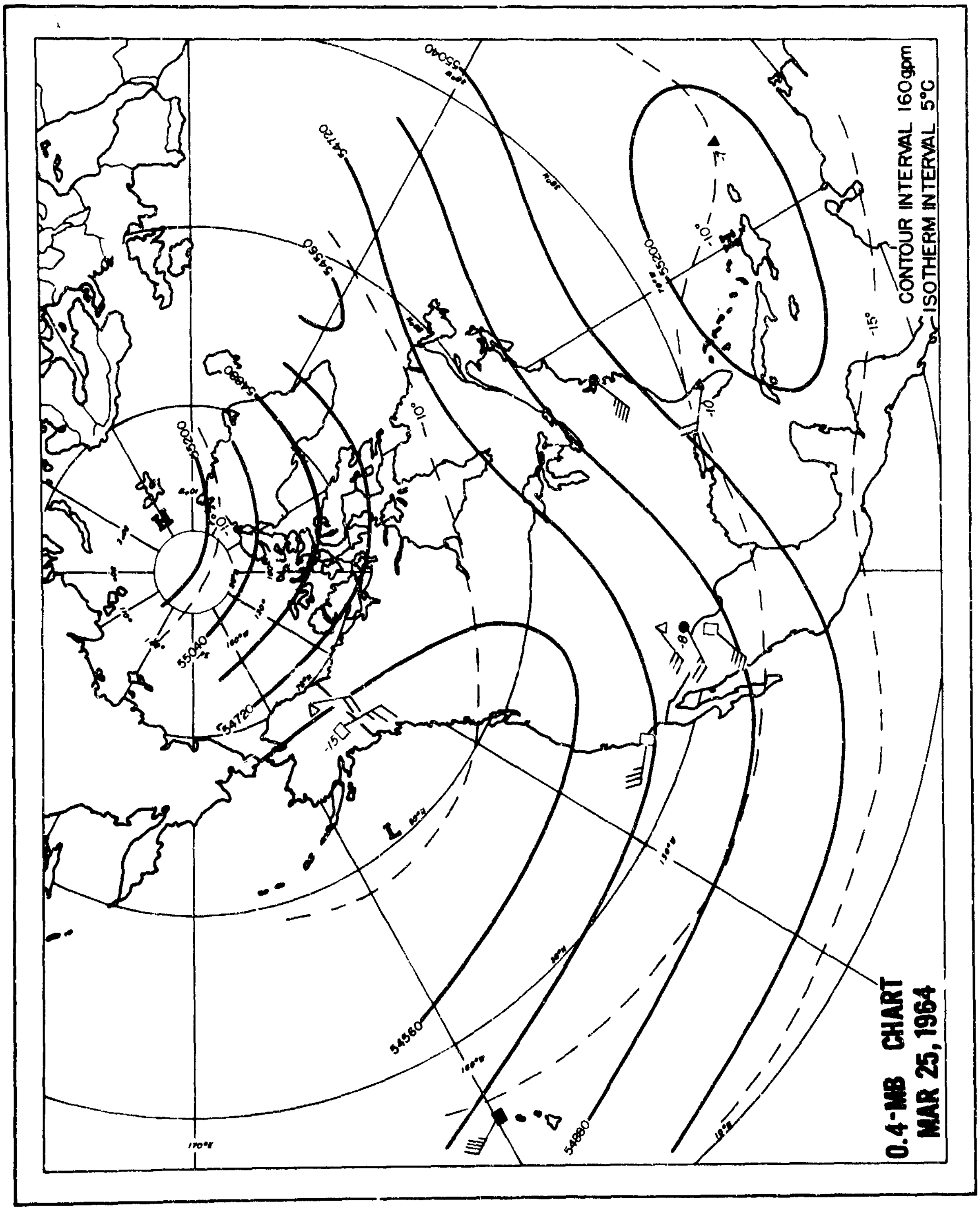

5-MB CHART
MAR 18, 1964
CONTOUR INTERVAL 160 gpm
ISOTHERM INTERVAL 5°C

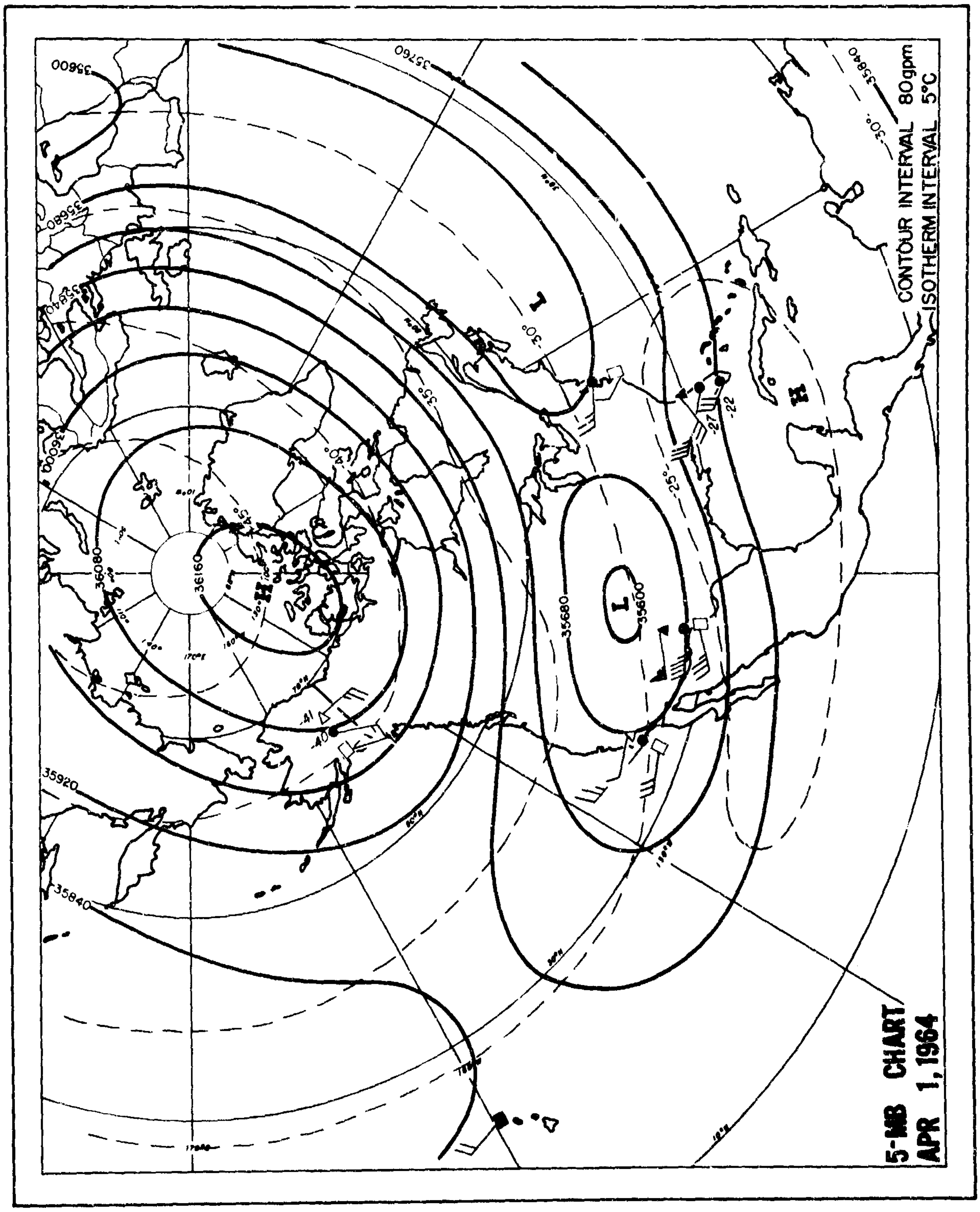

2-MB CHART
MAR 18,1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C

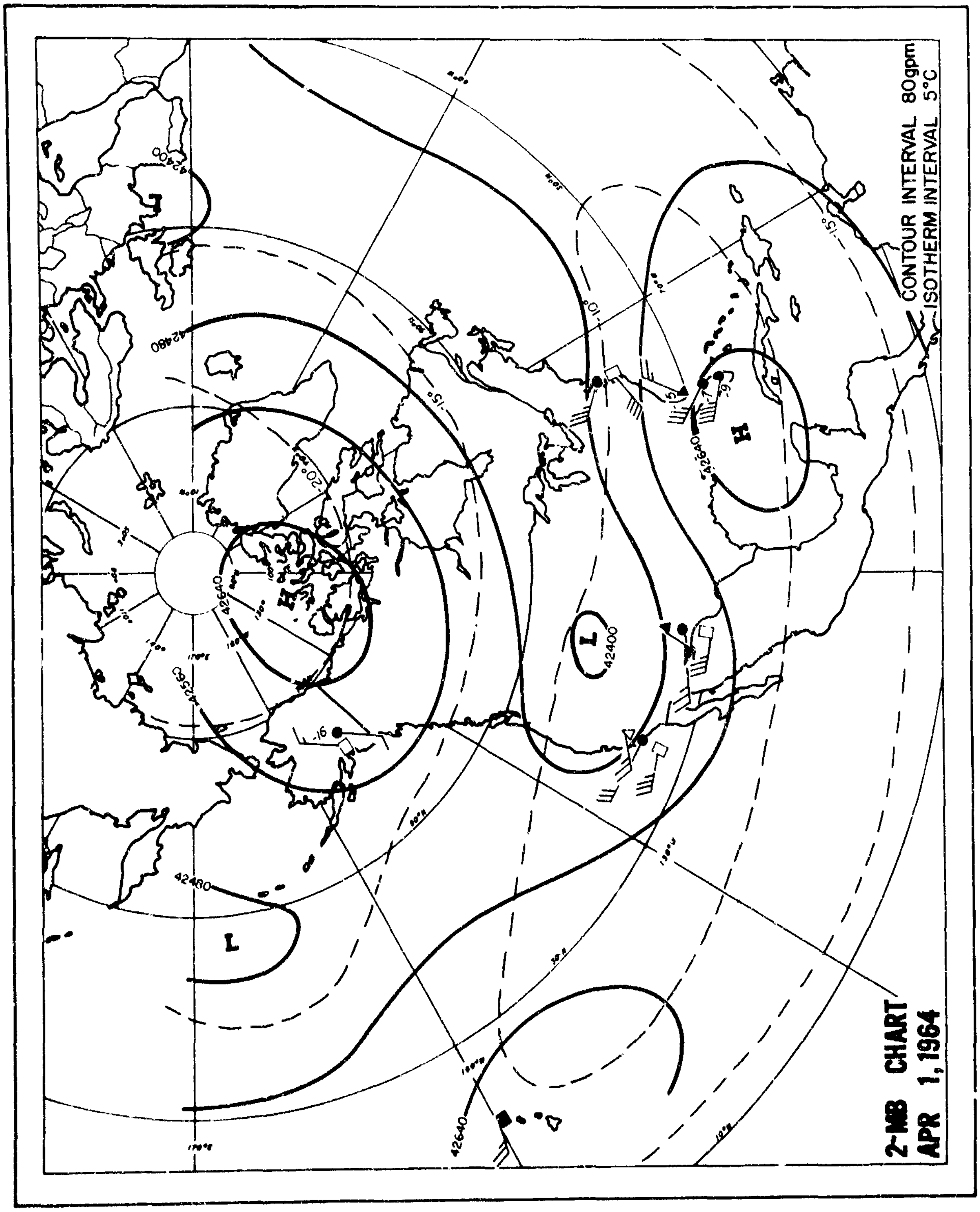

0.4-MB CHART
MAR 18, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C


5-MB CHART
MAR 25, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C

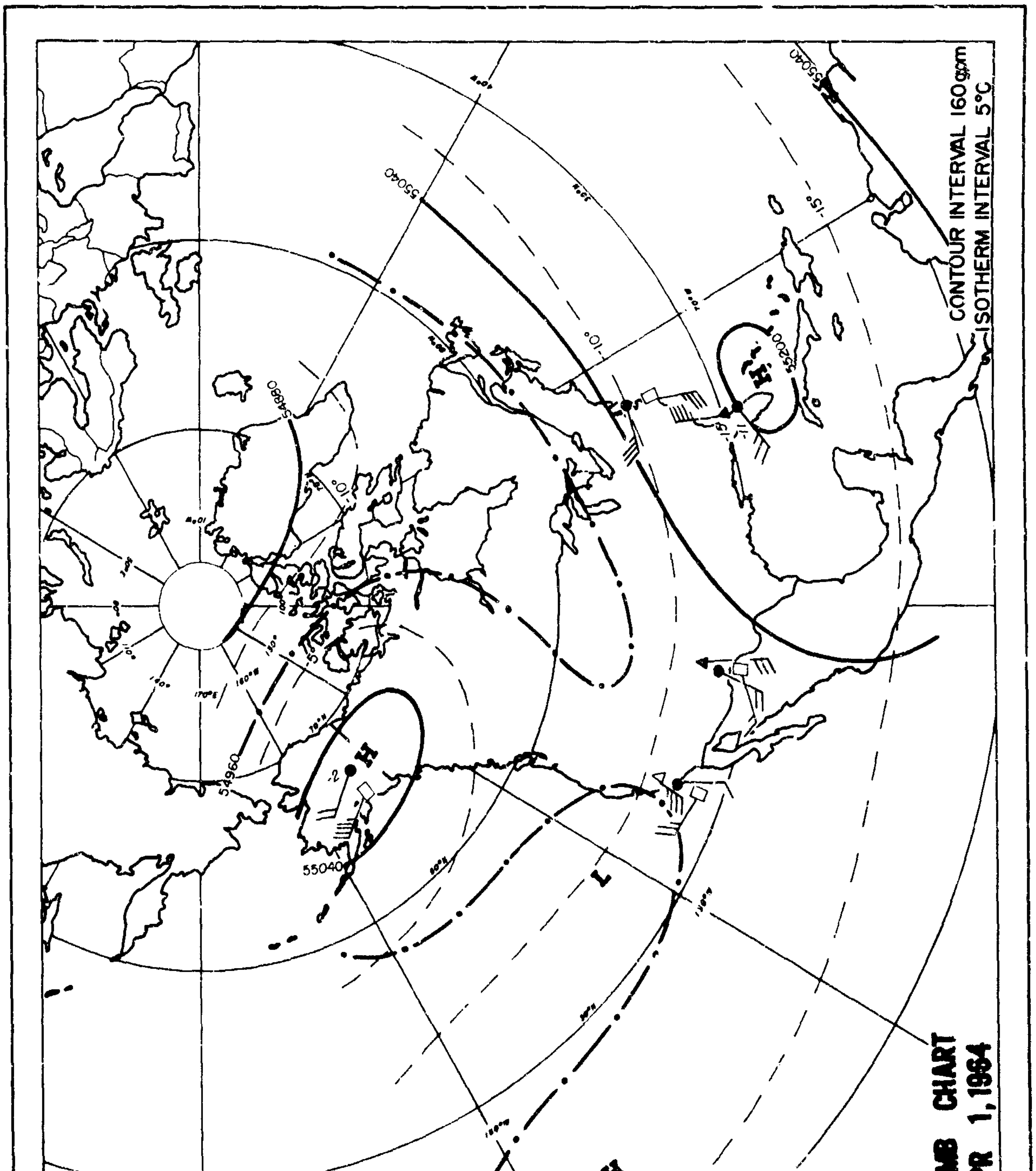

2-MB CHART
MAR 25, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C

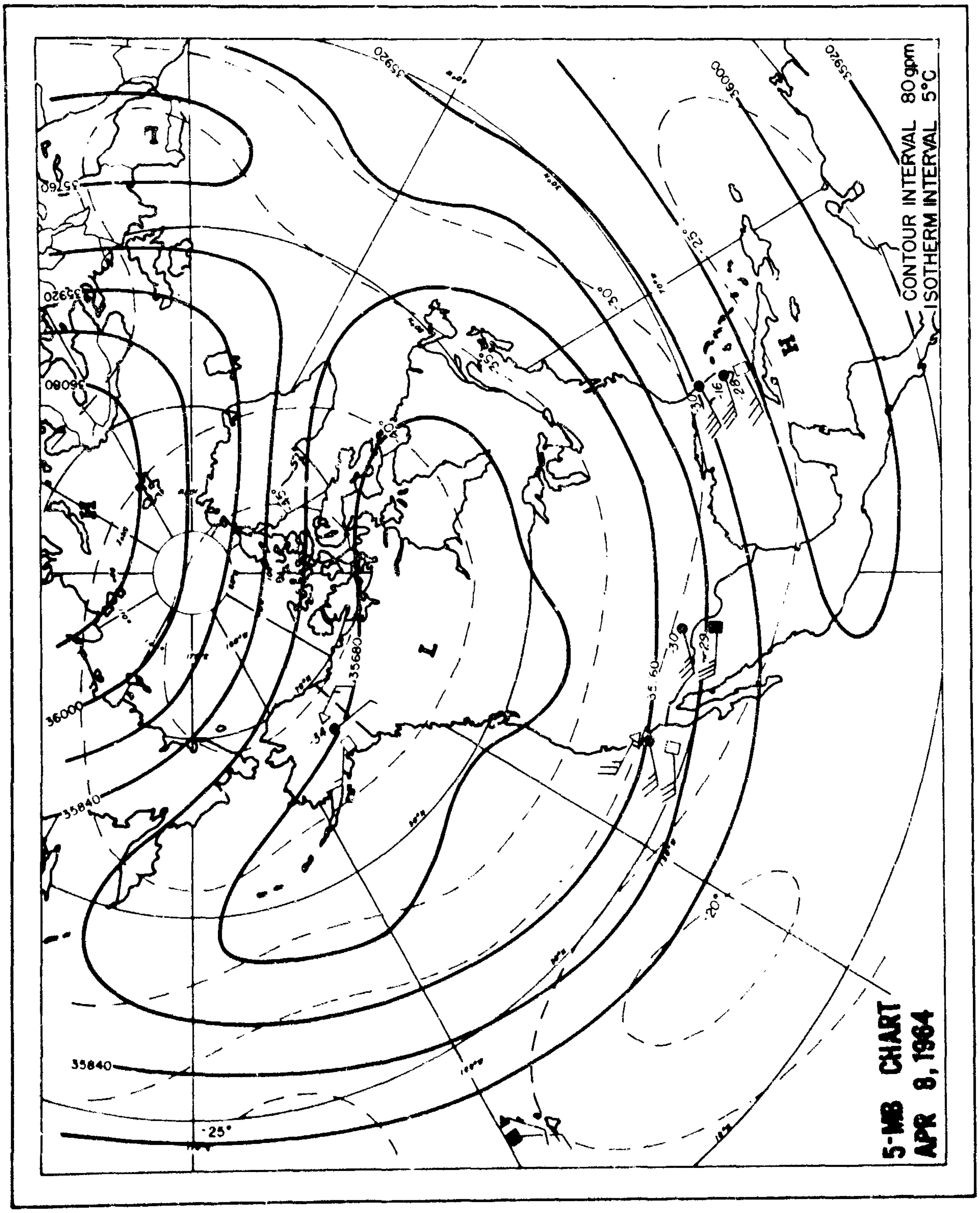

0.4-MB CHART
MAR 25, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
55040
54720
54560
55200
54880
H
L
-10°
-15°
-8

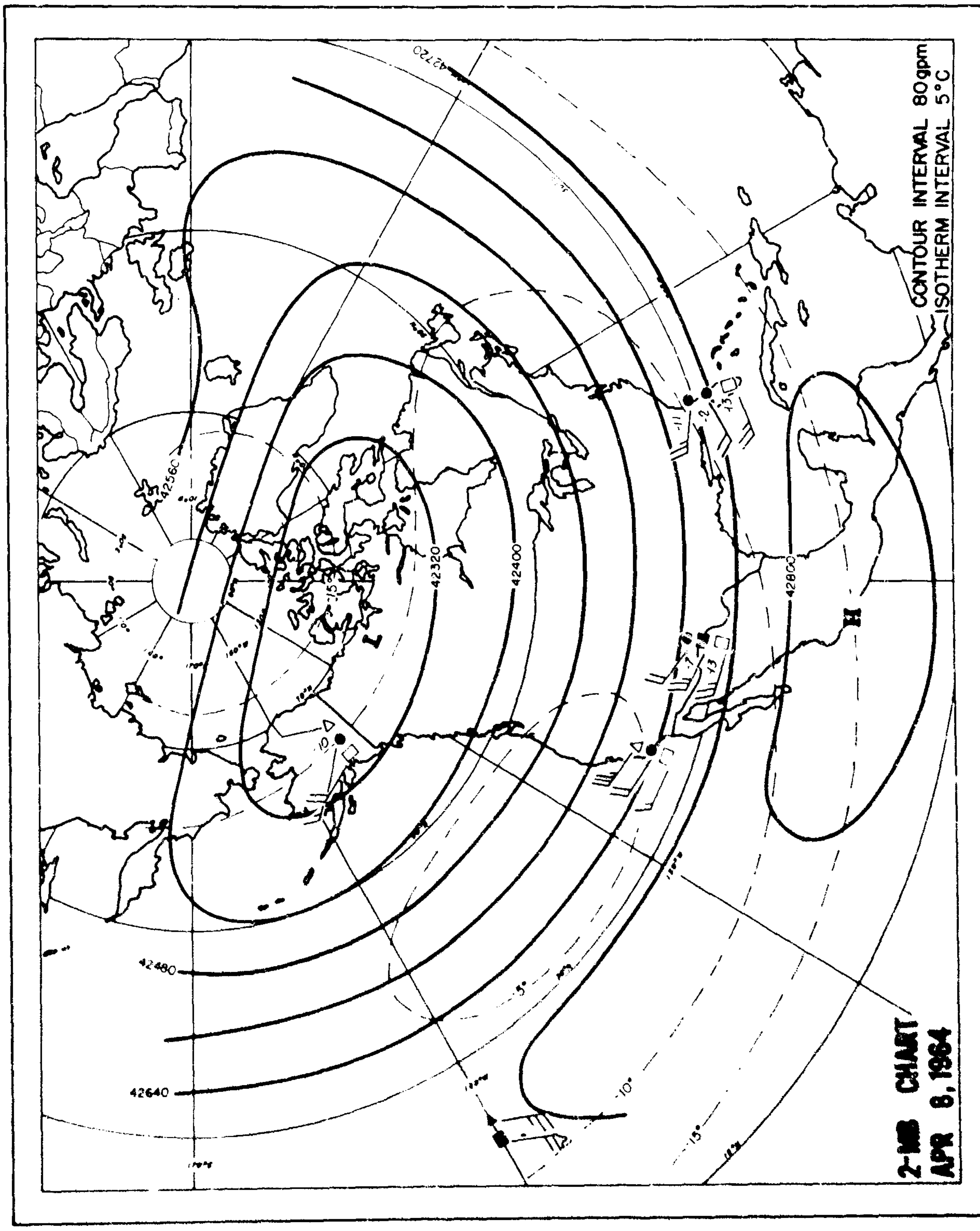

5-MB CHART
APR 1, 1964
CONTOUR INTERVAL 80gpm
ISOTHERM INTERVAL 5°C
35600
35680
35760
35840
35920
36000
36080
36160
L
H
30°
35°
-25°
-22
-27
-41
-40



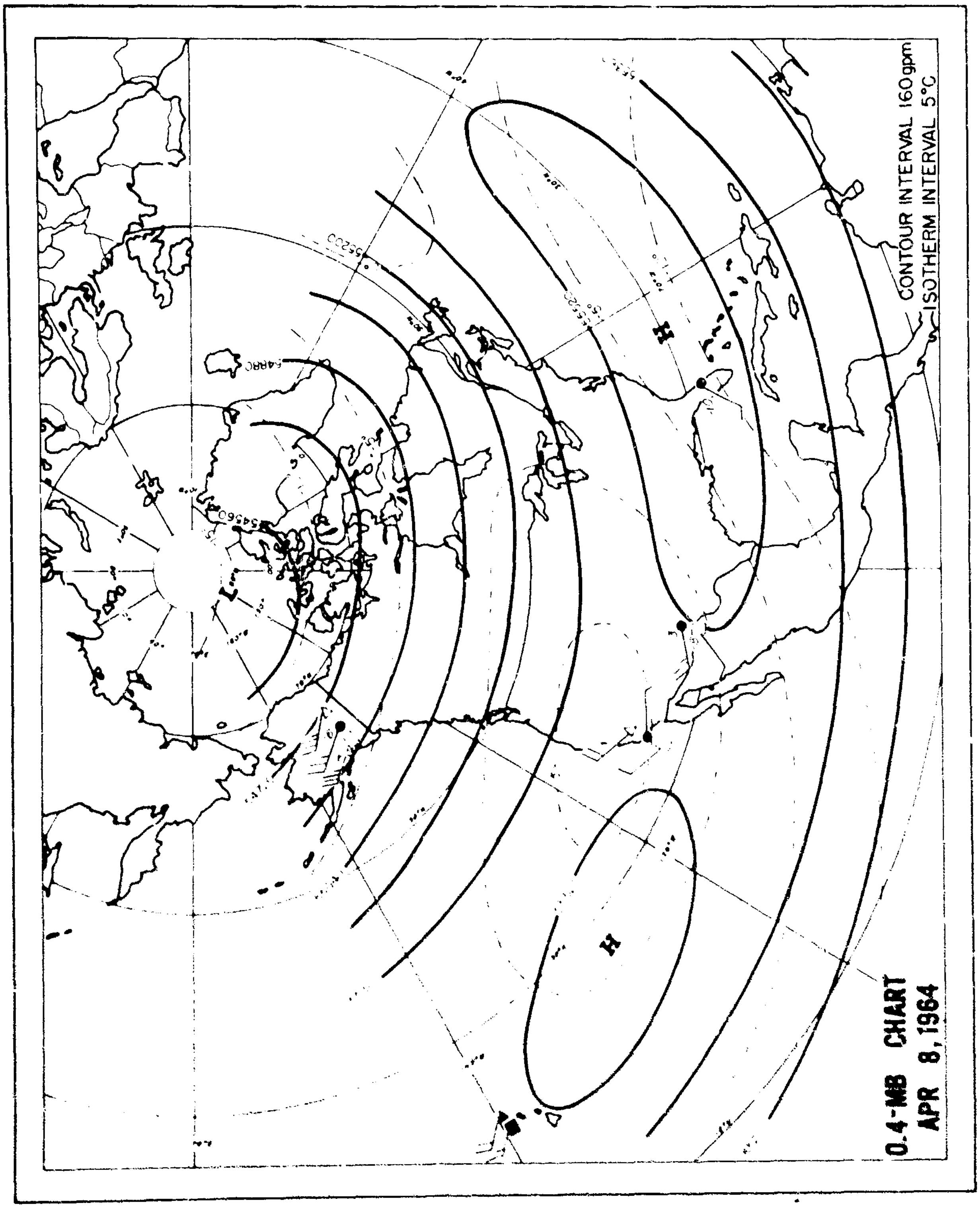
2-MB CHART
APR 1, 1964
CONTOUR INTERVAL 80gpm
ISOTHERM INTERVAL 5°C
42400
42480
42640
42560
H
L

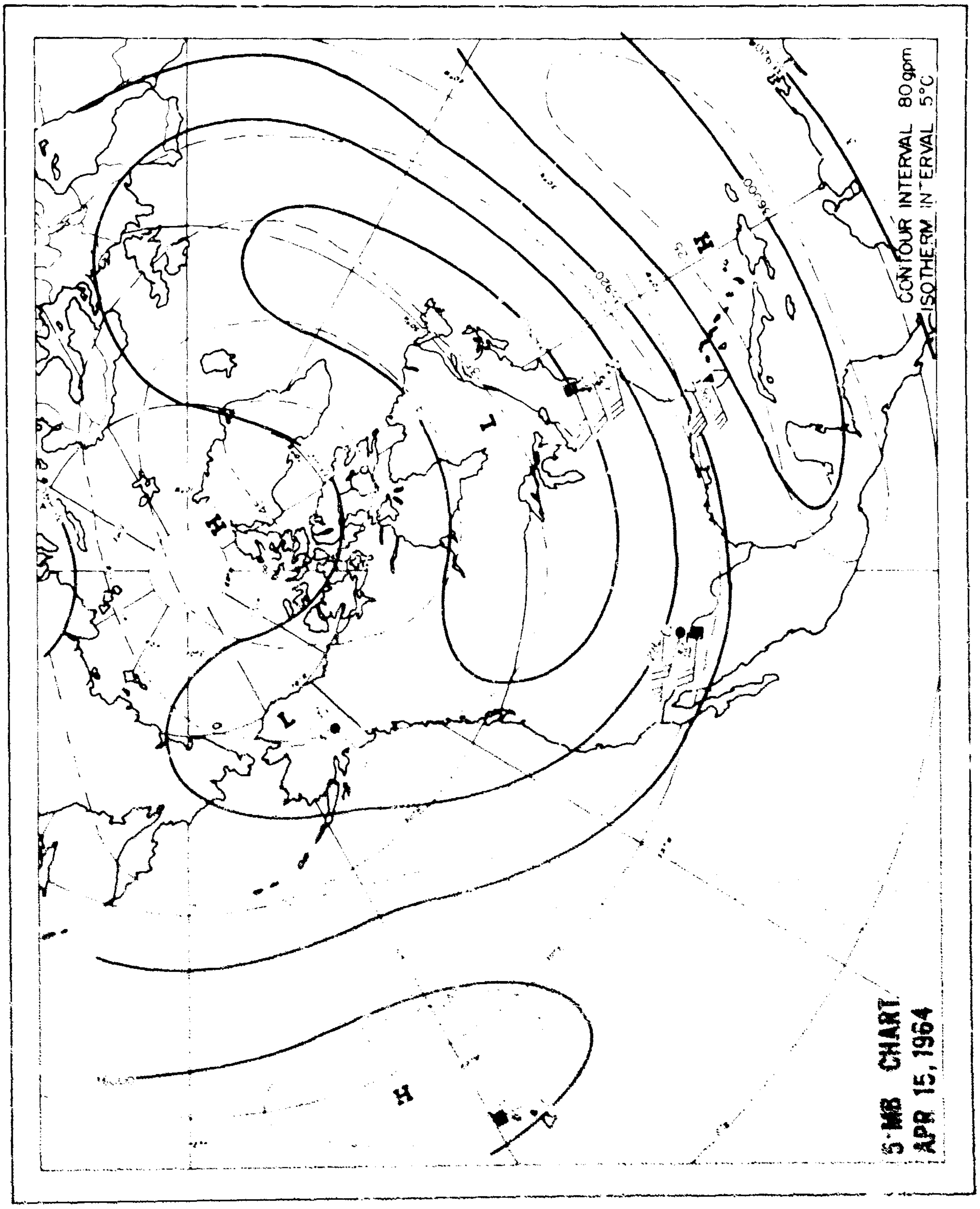

0.4-MB CHART
APR 1, 1964
CONTOUR INTERVAL 160 gpm
ISOTHERM INTERVAL 5°C
55040
55200
54880
54960
55040
54960
H
H
H
L
-10°
-15°

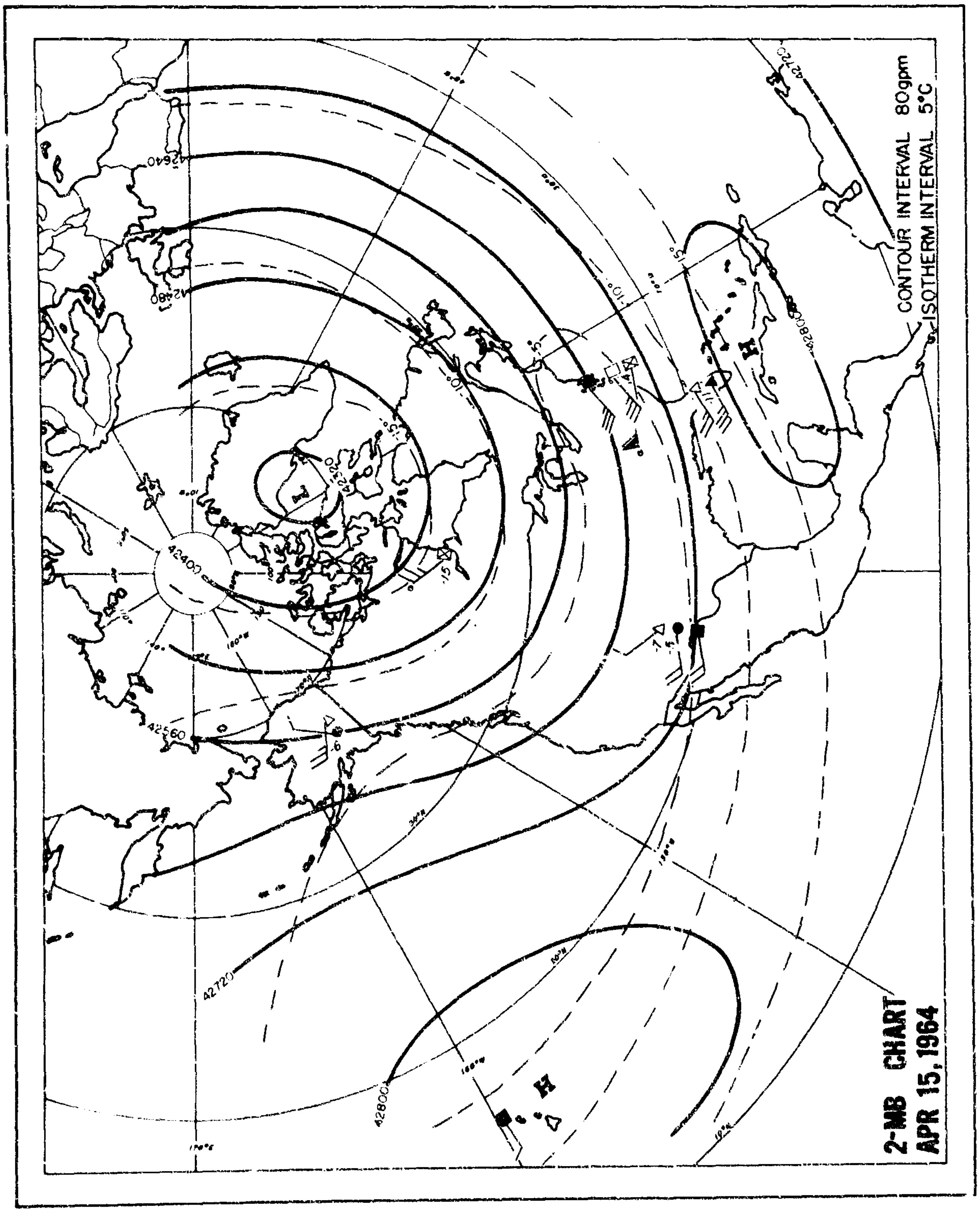

5-MB CHART
APR 8, 1964
CONTOUR INTERVAL 80 gpm
ISOTHERM INTERVAL 5°C

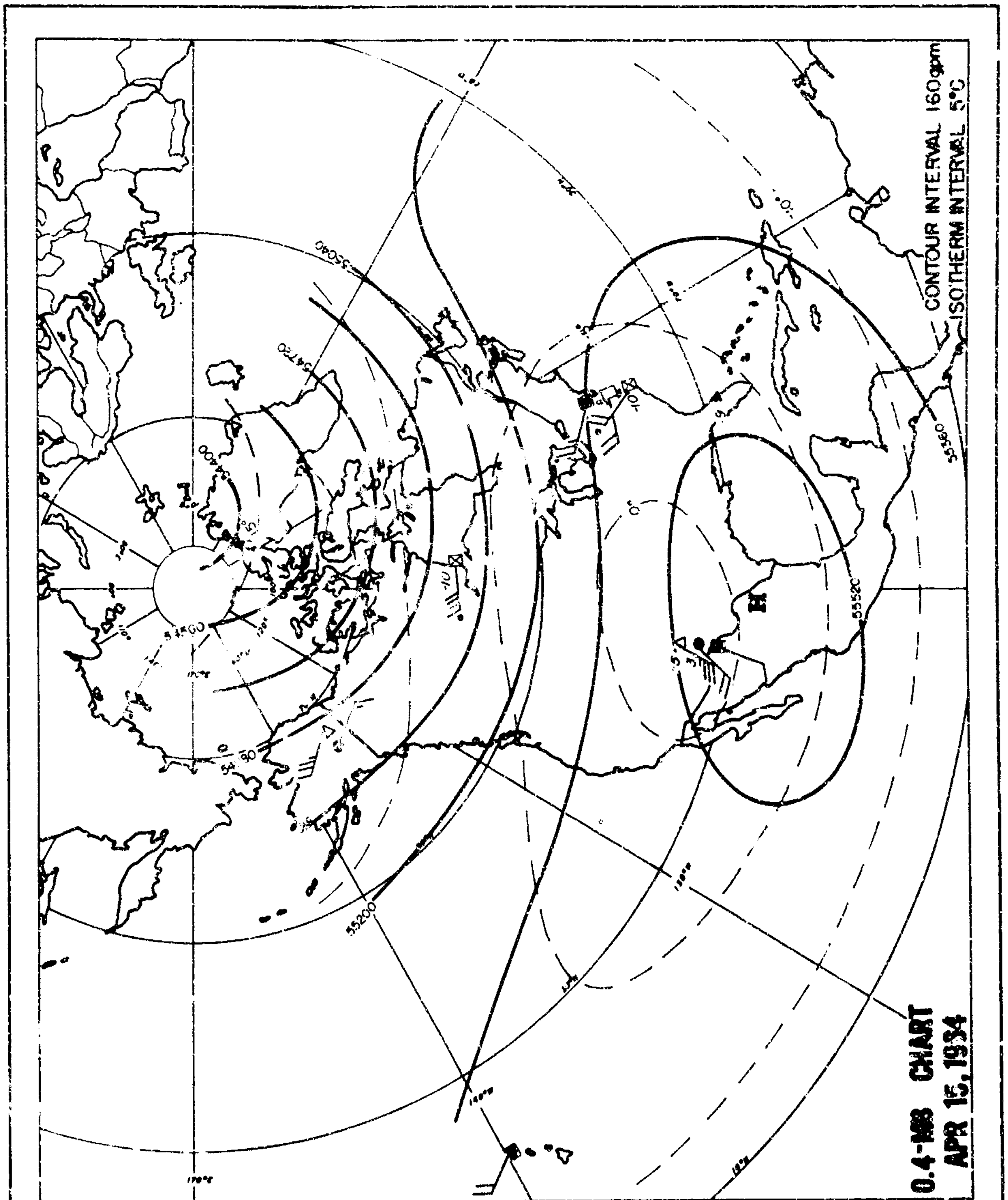


2-MB CHART
APR 8, 1964
CONTOUR INTERVAL 80gpm
ISOTHERM INTERVAL 5°C
42320
42400
42480
42560
42640
42720
42800
H
L
-5°
-10°
-15°

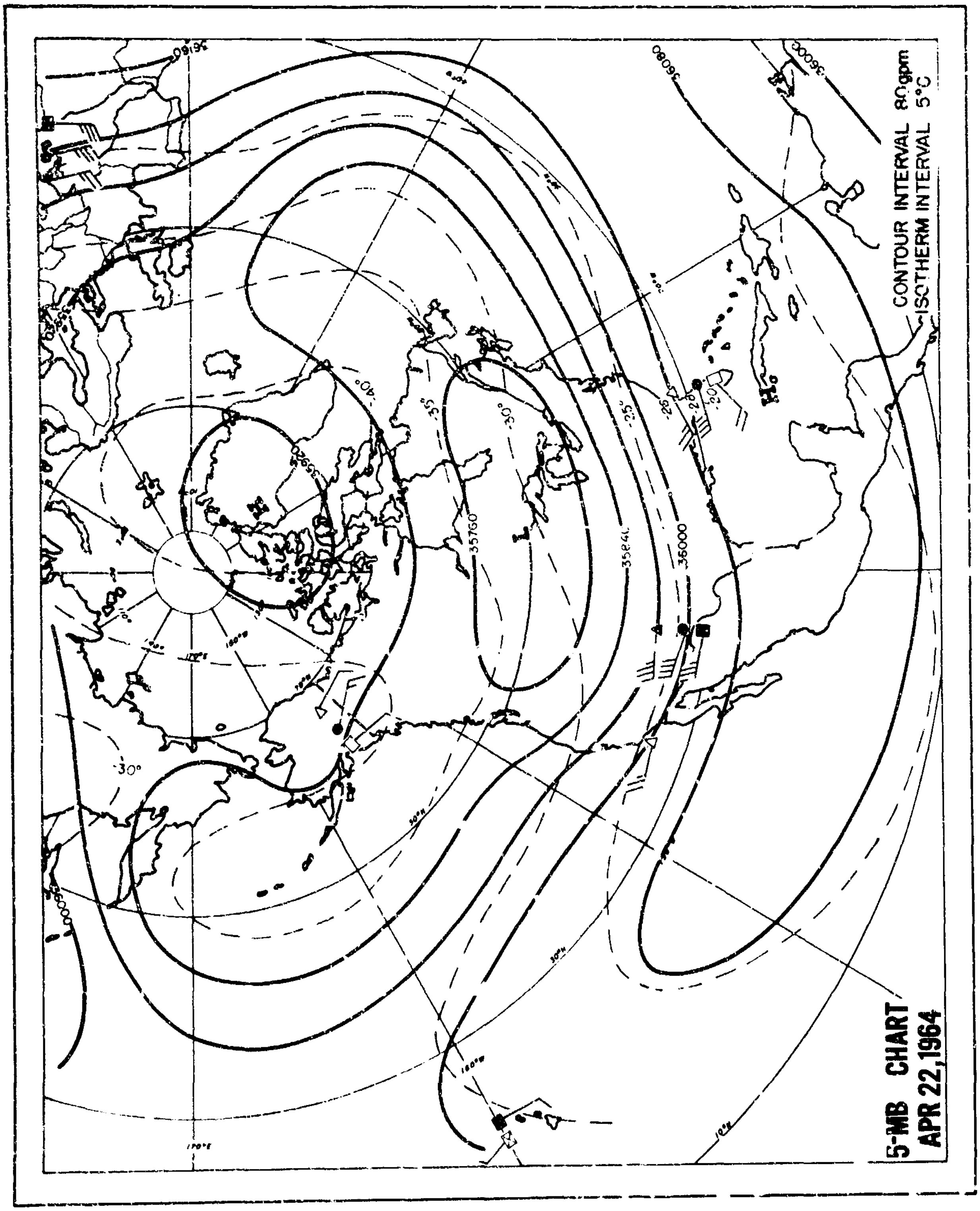

0.4-MB CHART
APR 8, 1964
CONTOUR INTERVAL 160 gpm
ISOTHERM INTERVAL 5°C

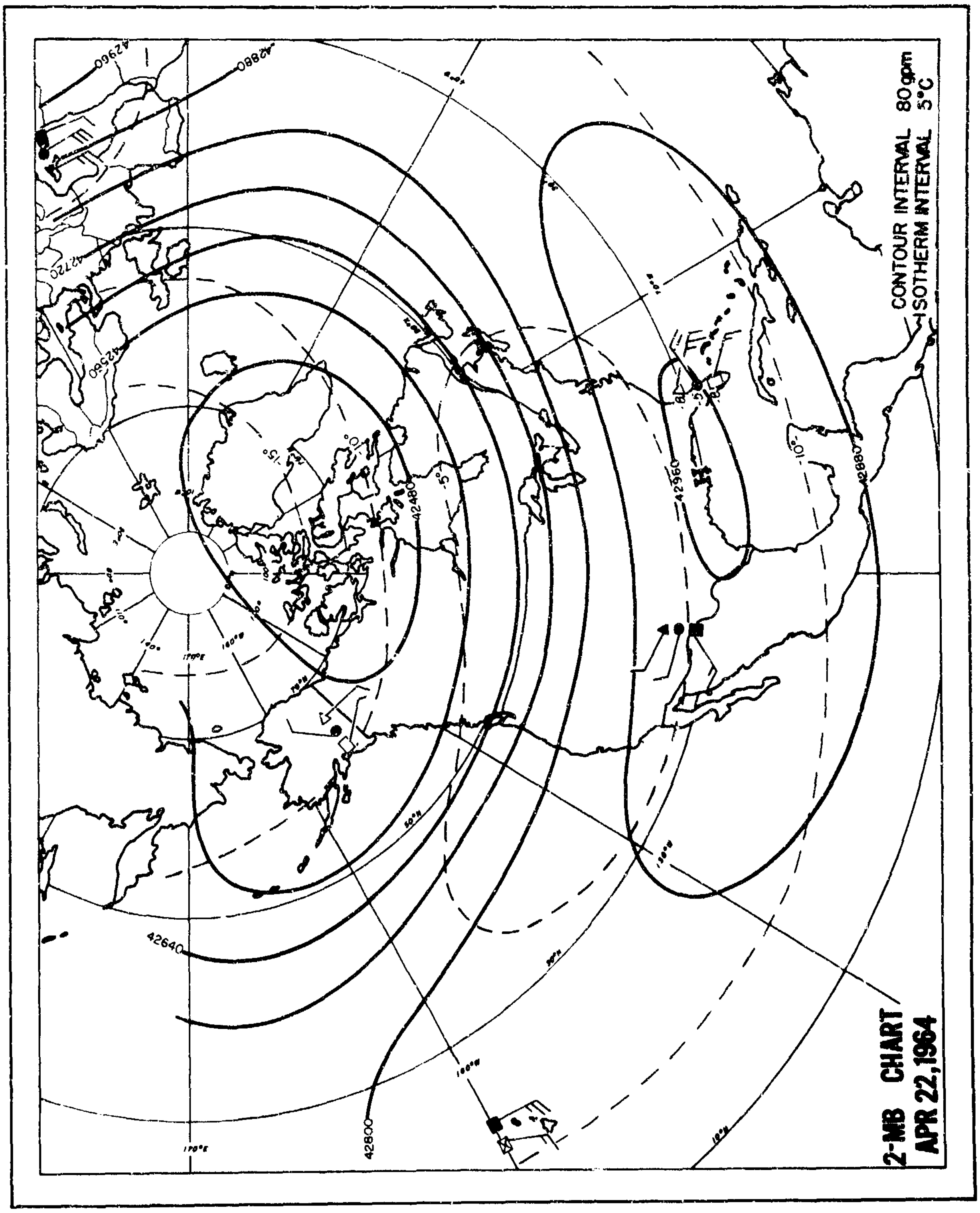

5-MB CHART
APR 15, 1964
CONTOUR INTERVAL 80 gpm
ISOTHERM INTERVAL 5°C

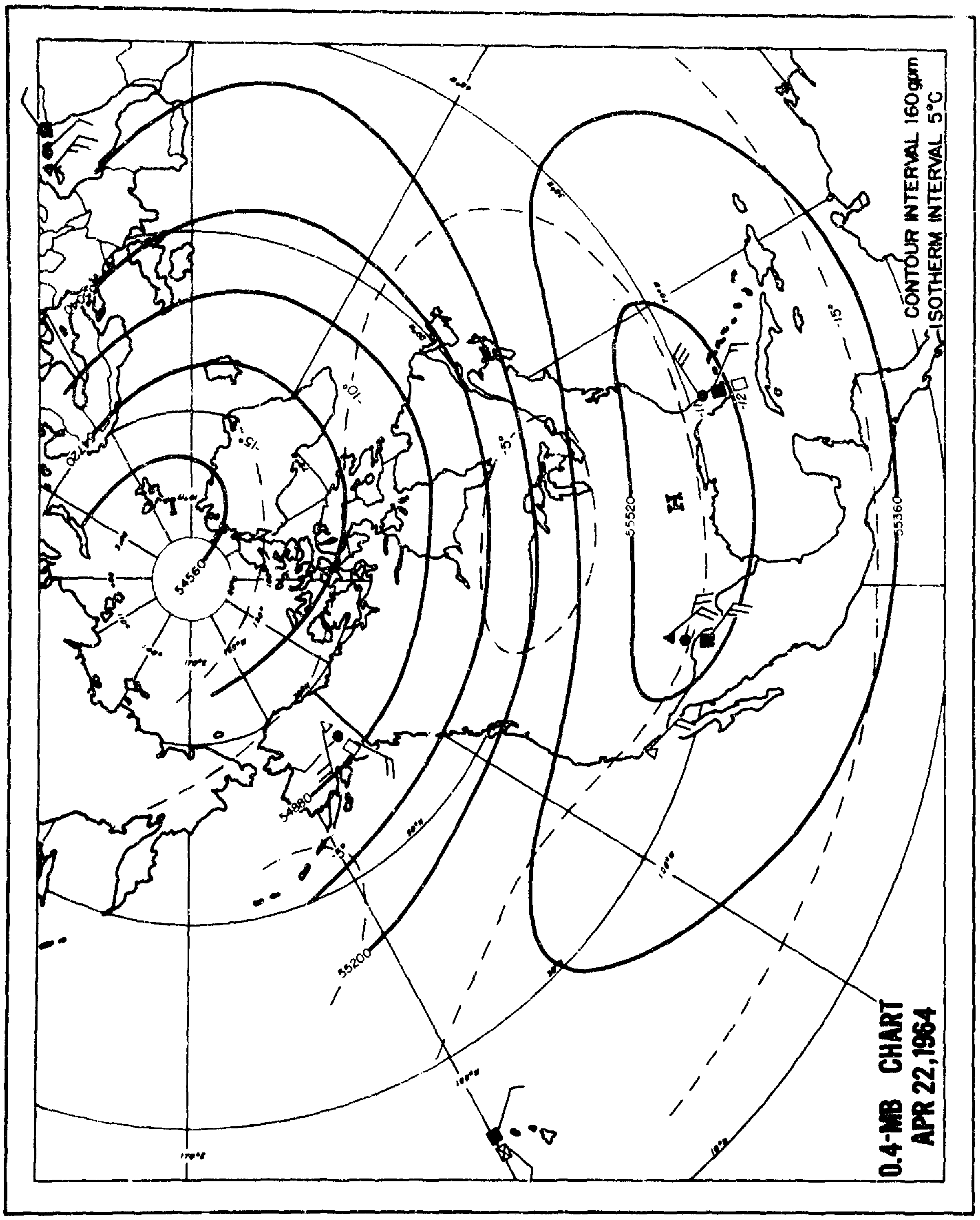

2-MB CHART
APR 15, 1964
CONTOUR INTERVAL 80gpm
ISOTHERM INTERVAL 5°C
42720
42640
42480
42520
42400
42560
42720
42800
42800



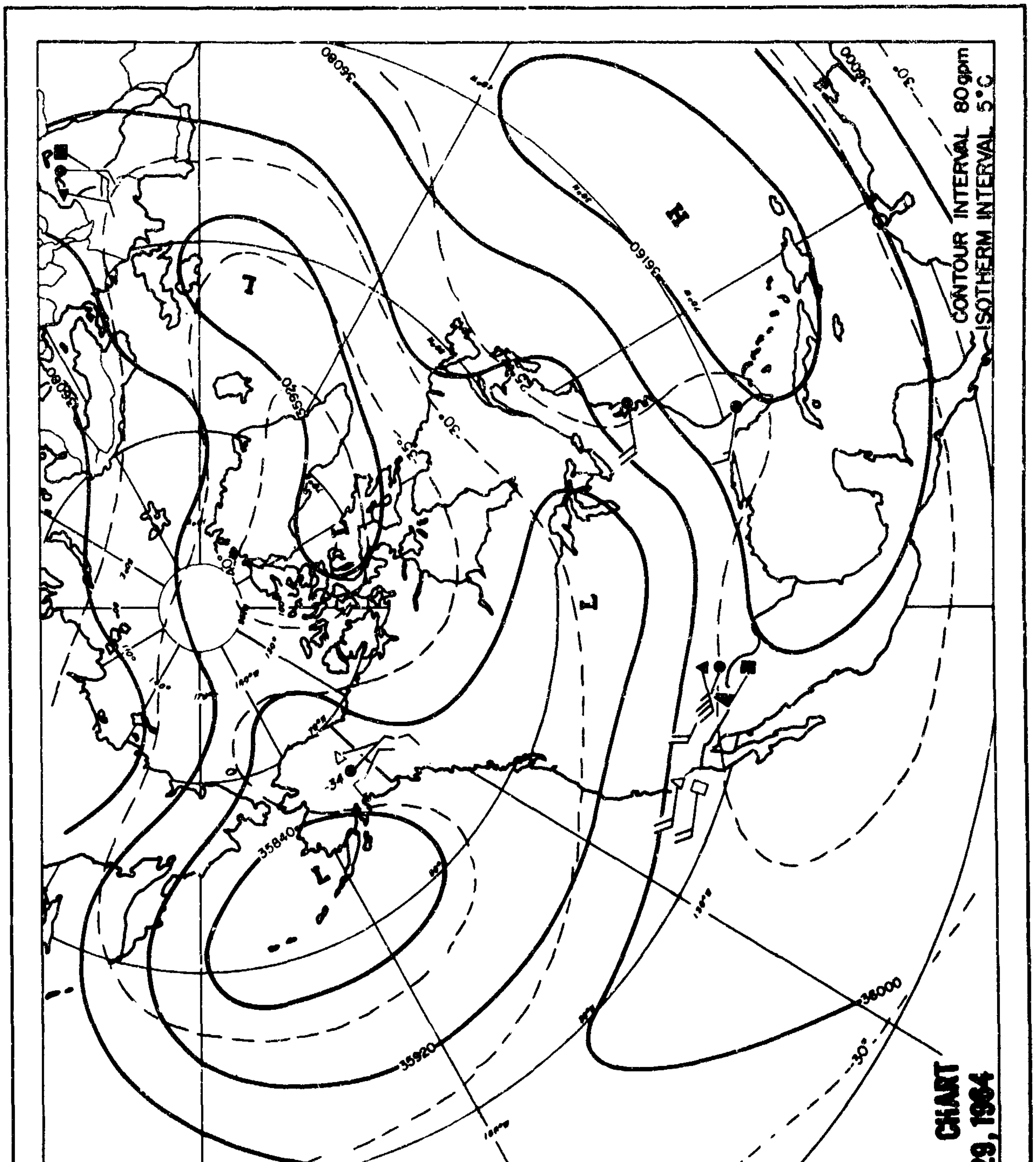
0.4-MB CHART
APR 15, 1954
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
55040
54720
54400
55200
55360
55520

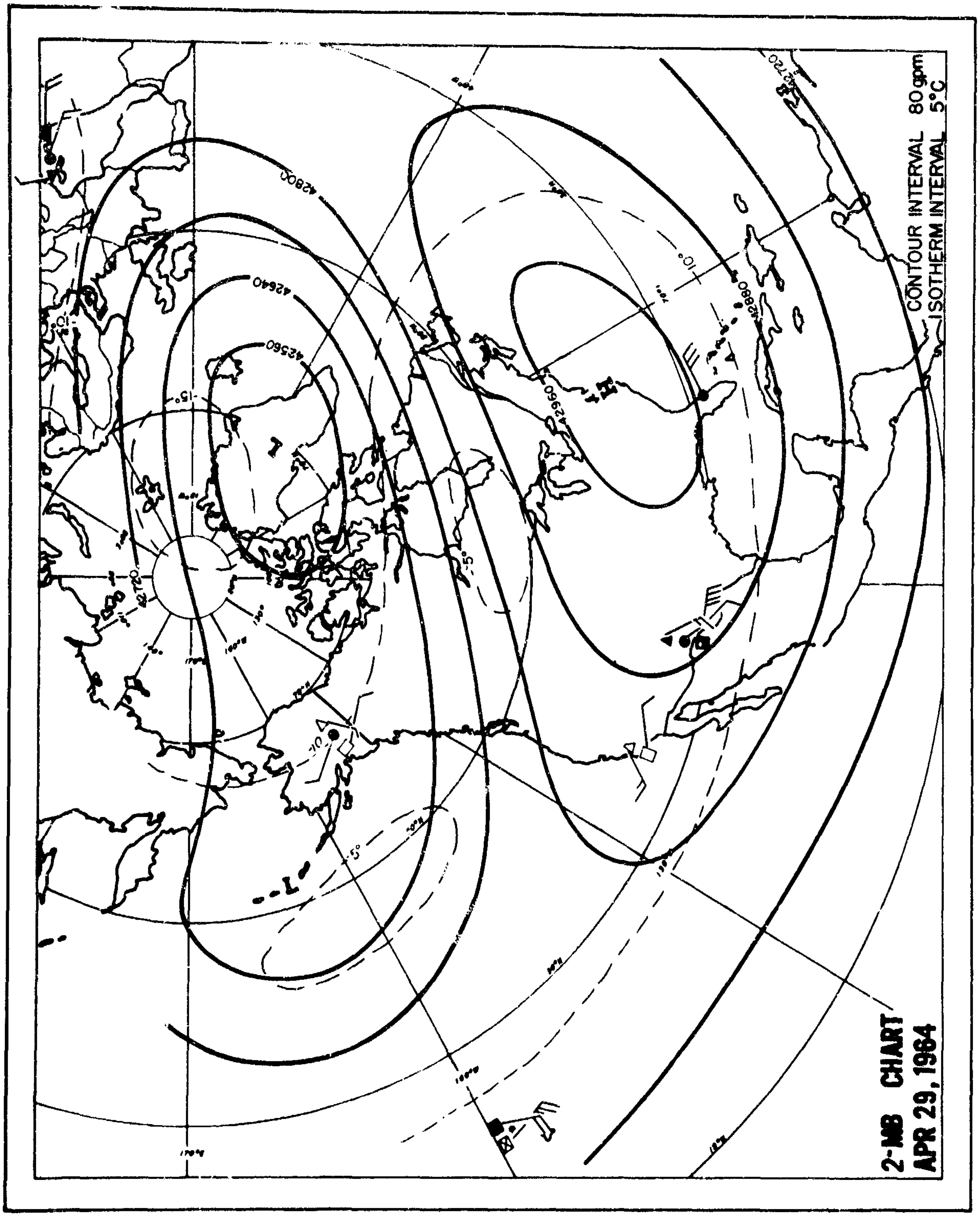

5-MB CHART
APR 22,1964
CONTOUR INTERVAL 80 gpm
ISOTHERM INTERVAL 5°C
35760
35840
36000
-30°
-35°
-40°


2-MB CHART
APR 22,1964
CONTOUR INTERVAL 80 gpm
ISOTHERM INTERVAL 5°C
42960
42880
42720
42560
42480
42640
42800
42960
42880
-15°
-10°
-5°
-10°

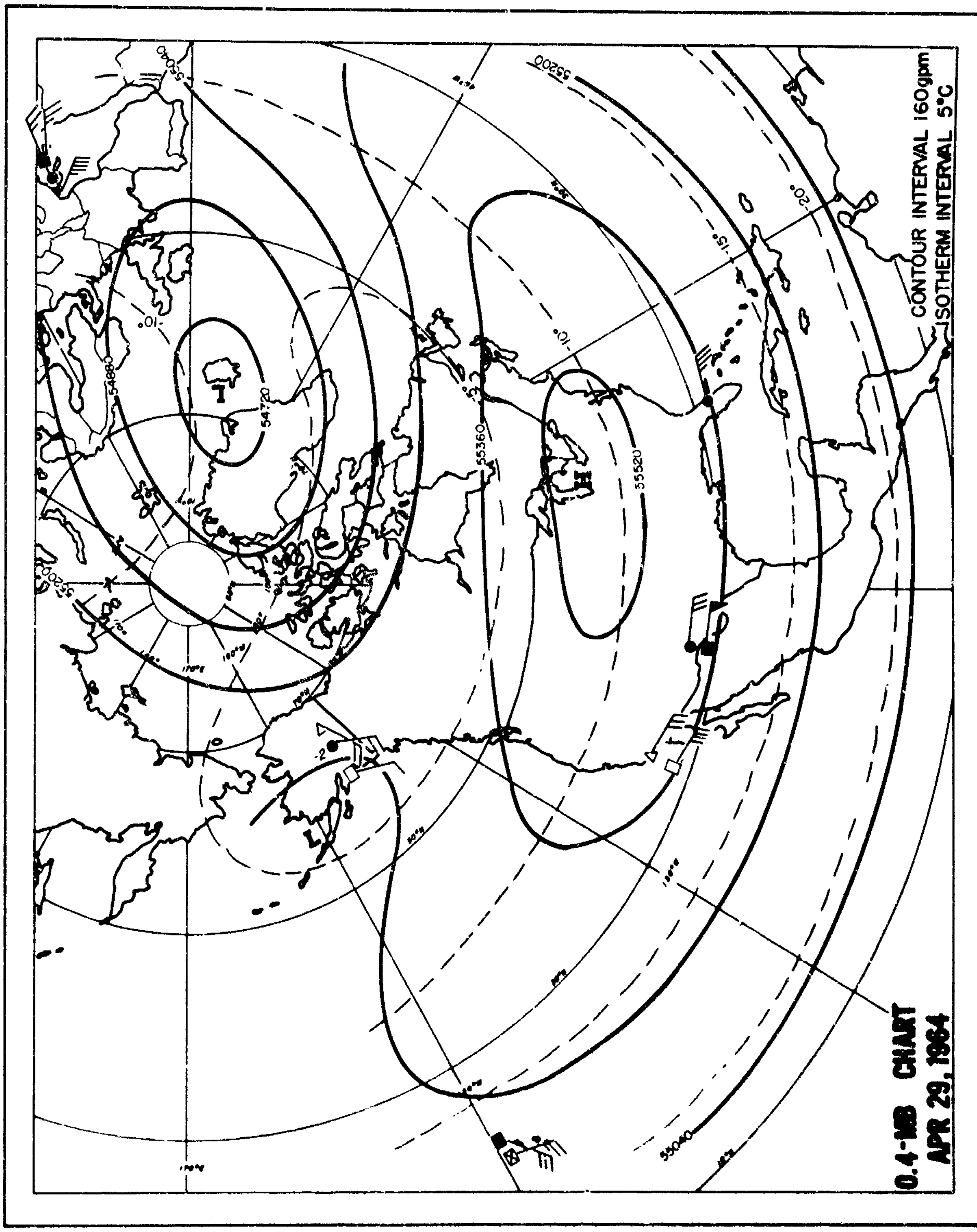


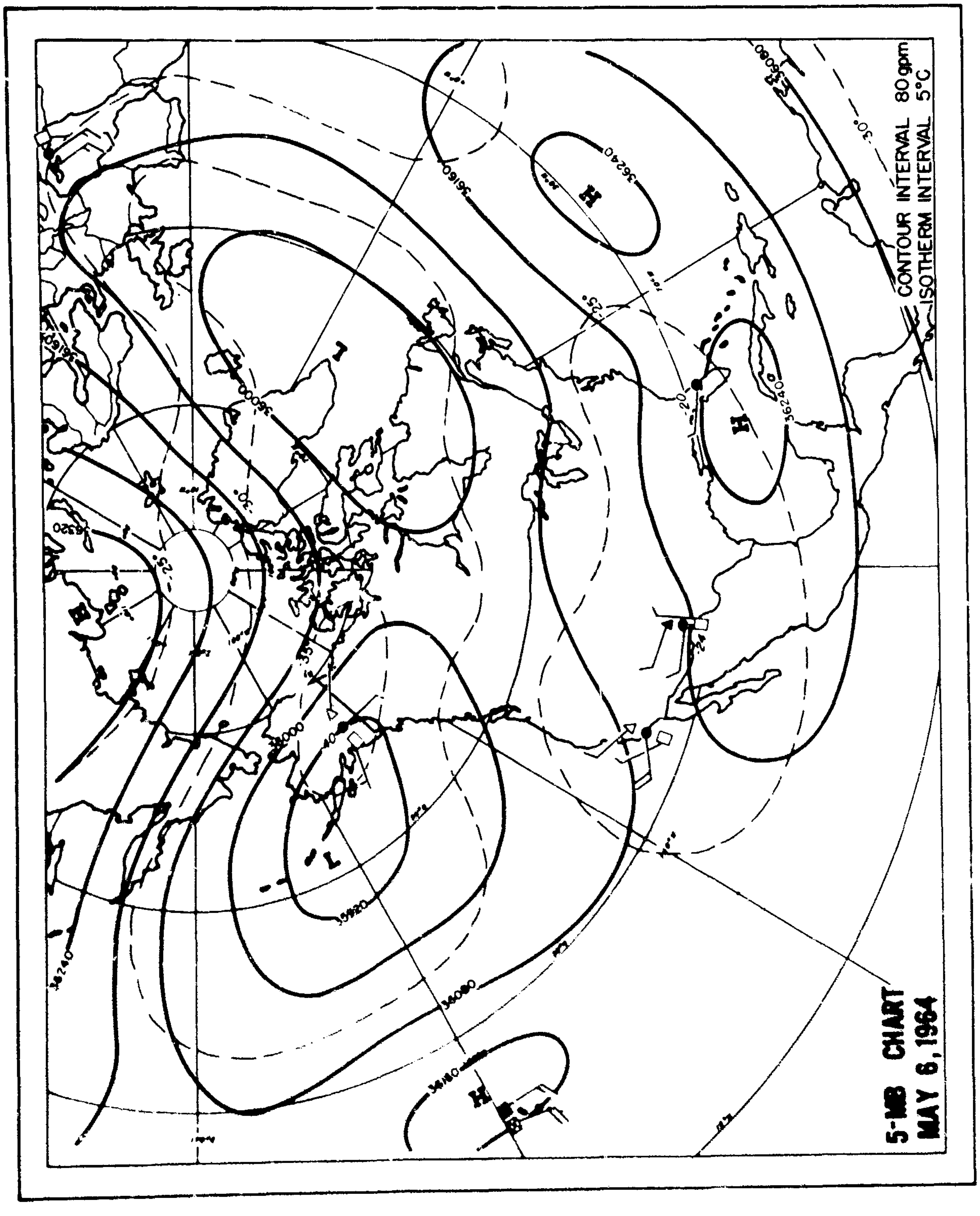
0.4-MB CHART
APR 22,1964
CONTOUR INTERVAL 160 gpm
ISOTHERM INTERVAL 5°C
54560
54880
55200
55520
55360
H
L
-5°
-10°
-15°
-12

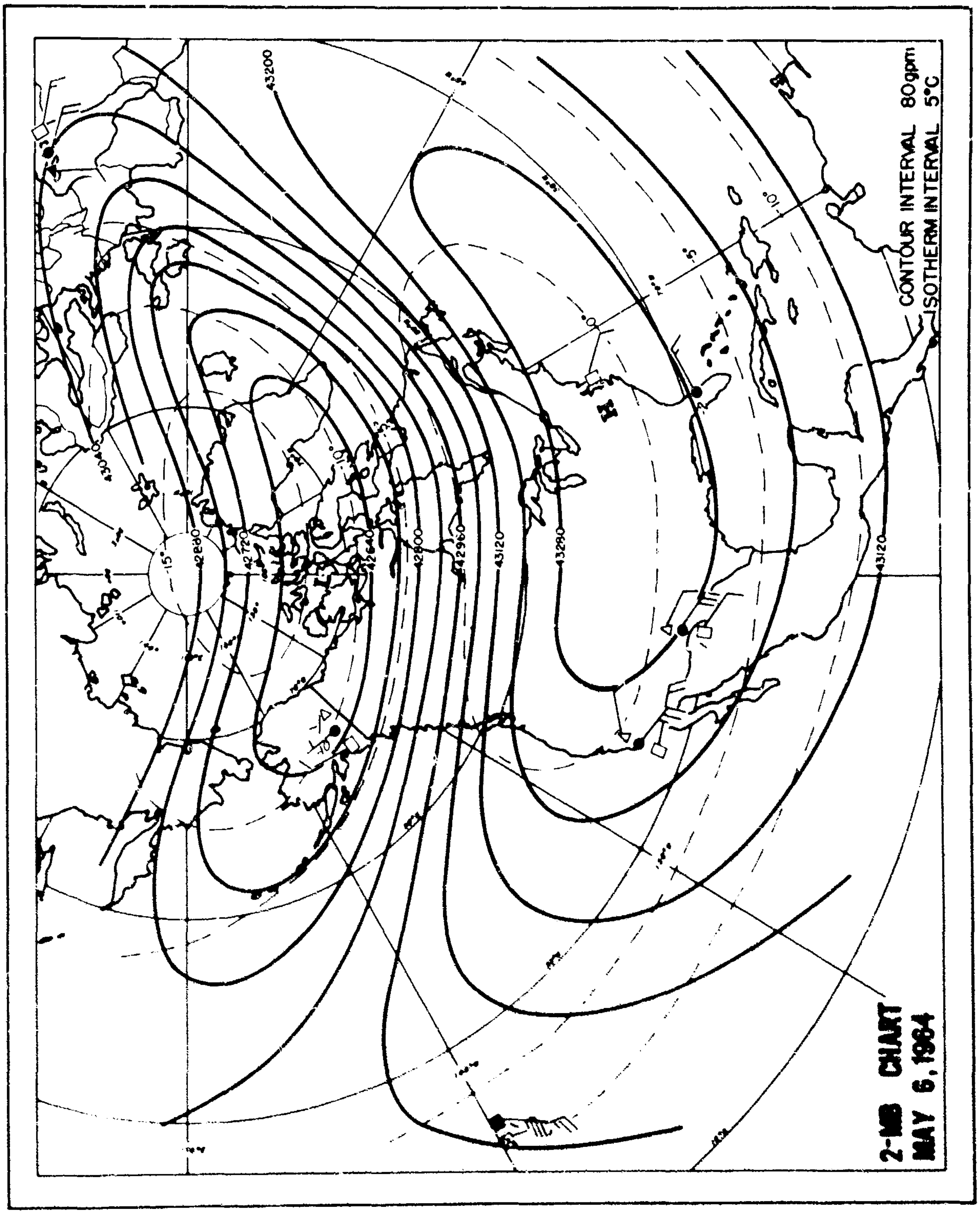

5-MB CHART
APR. 29, 1964
CONTOUR INTERVAL 80 gpm
ISOTHERM INTERVAL 5°C
36080
36160
36000
35920
35840
H
L
-30°
-34

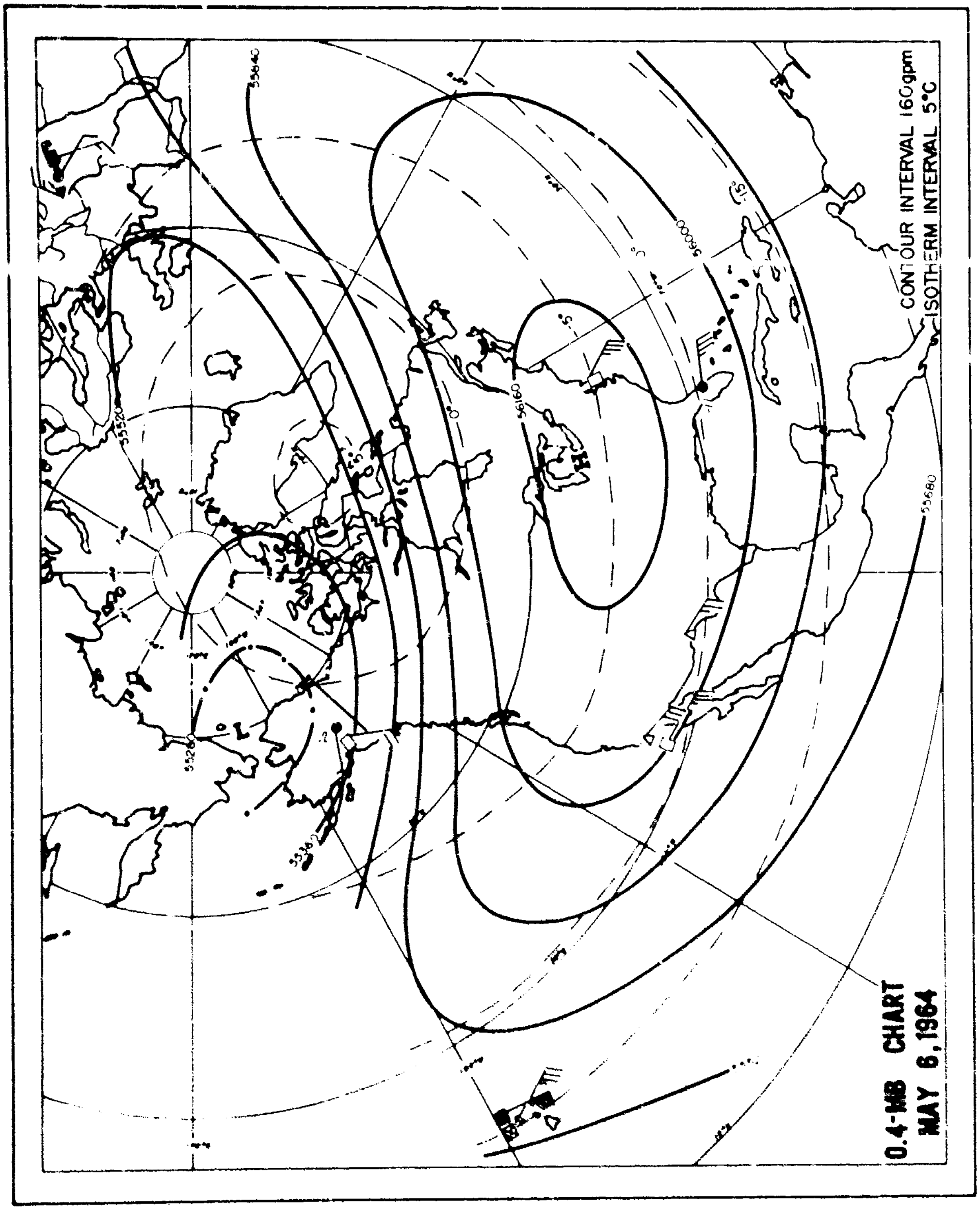


2-MB CHART
APR 29, 1964
CONTOUR INTERVAL 80 gpm
ISOTHERM INTERVAL 5°C
42800
42640
42560
42720
42880
42960

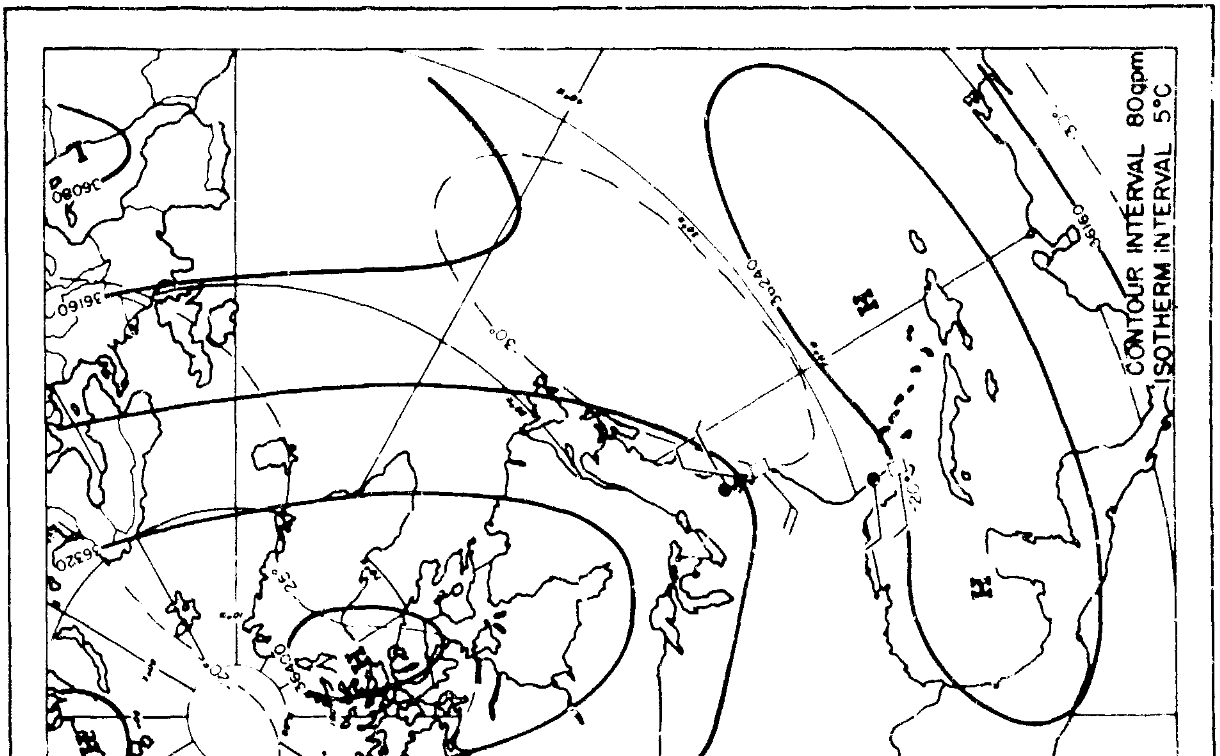

0.4-MB CHART
APR 29, 1964
CONTOUR INTERVAL 160 gpm
ISOTHERM INTERVAL 5°C
55200
55040
54880
54720
55360
55520
L
H

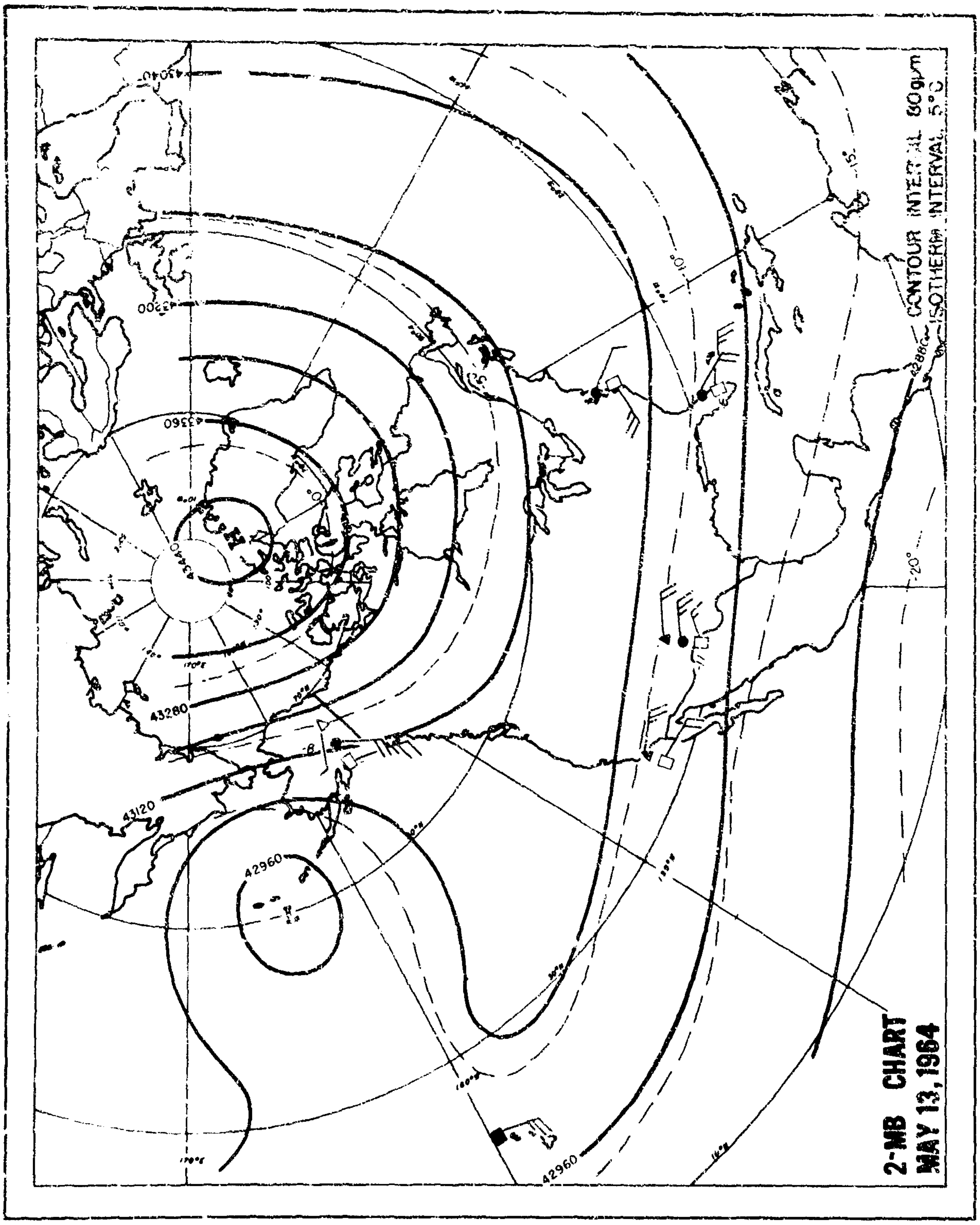

5-MB CHART
MAY 6, 1964
CONTOUR INTERVAL 80 gpm
ISOTHERM INTERVAL 5°C


2-MB CHART
MAY 6, 1964
CONTOUR INTERVAL 80gpm
ISOTHERM INTERVAL 5°C
43200
43040
42880
42720
42640
42800
42960
43120
43280
43120
H
L

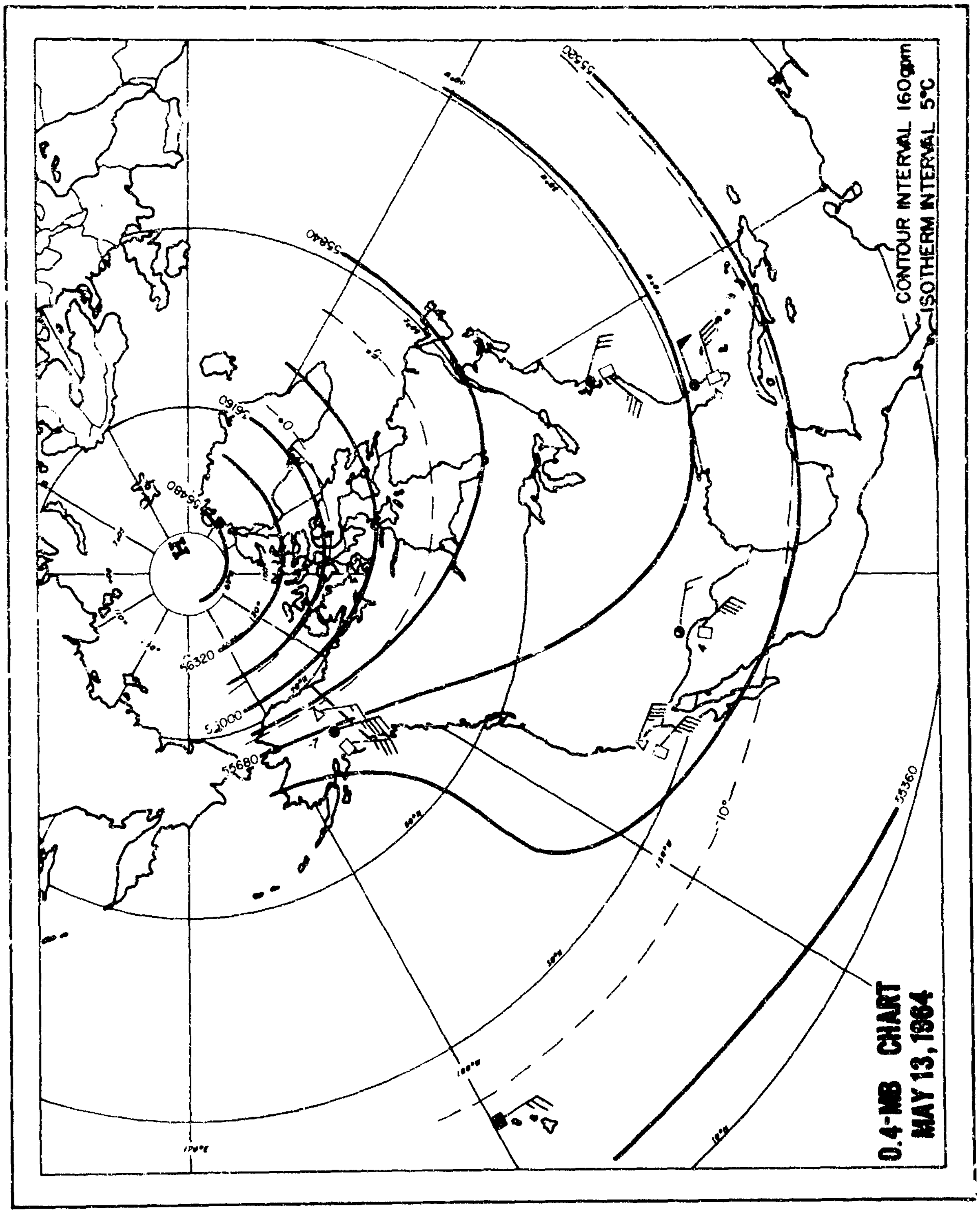


0.4-MB CHART
MAY 6, 1964

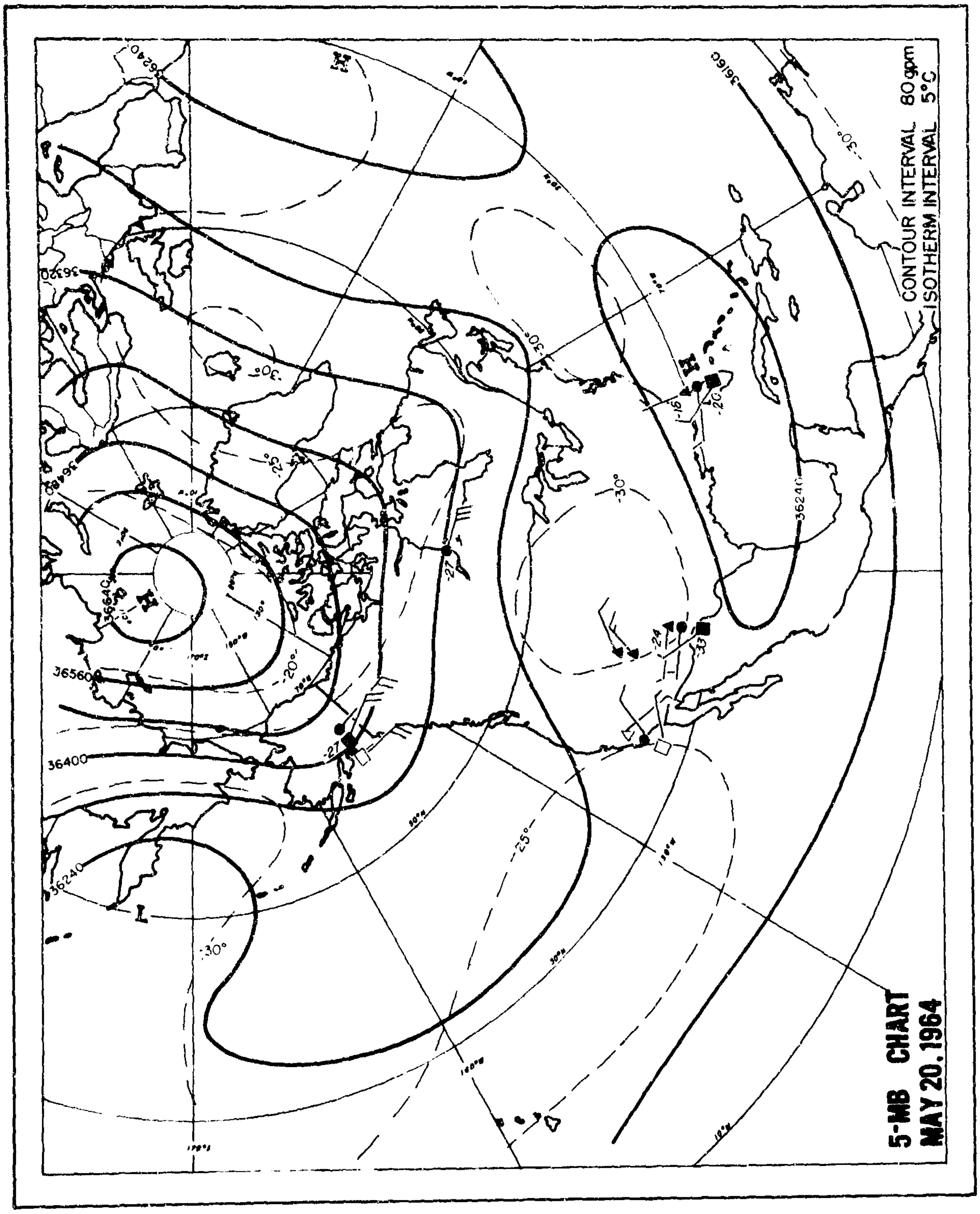

5-MB CHART
MAY 13, 1964
CONTOUR INTERVAL 80gpm
ISOTHERM INTERVAL 5°C

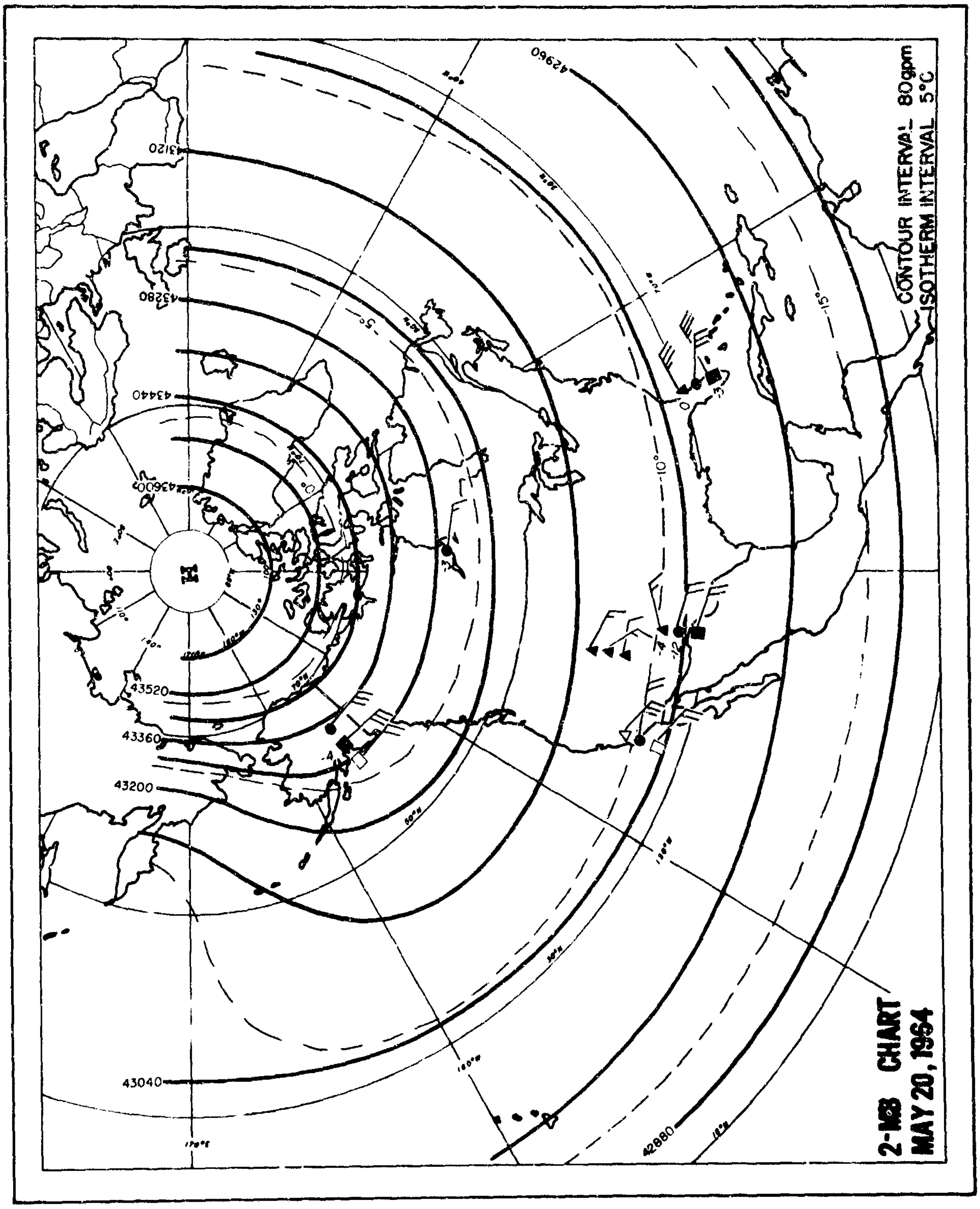


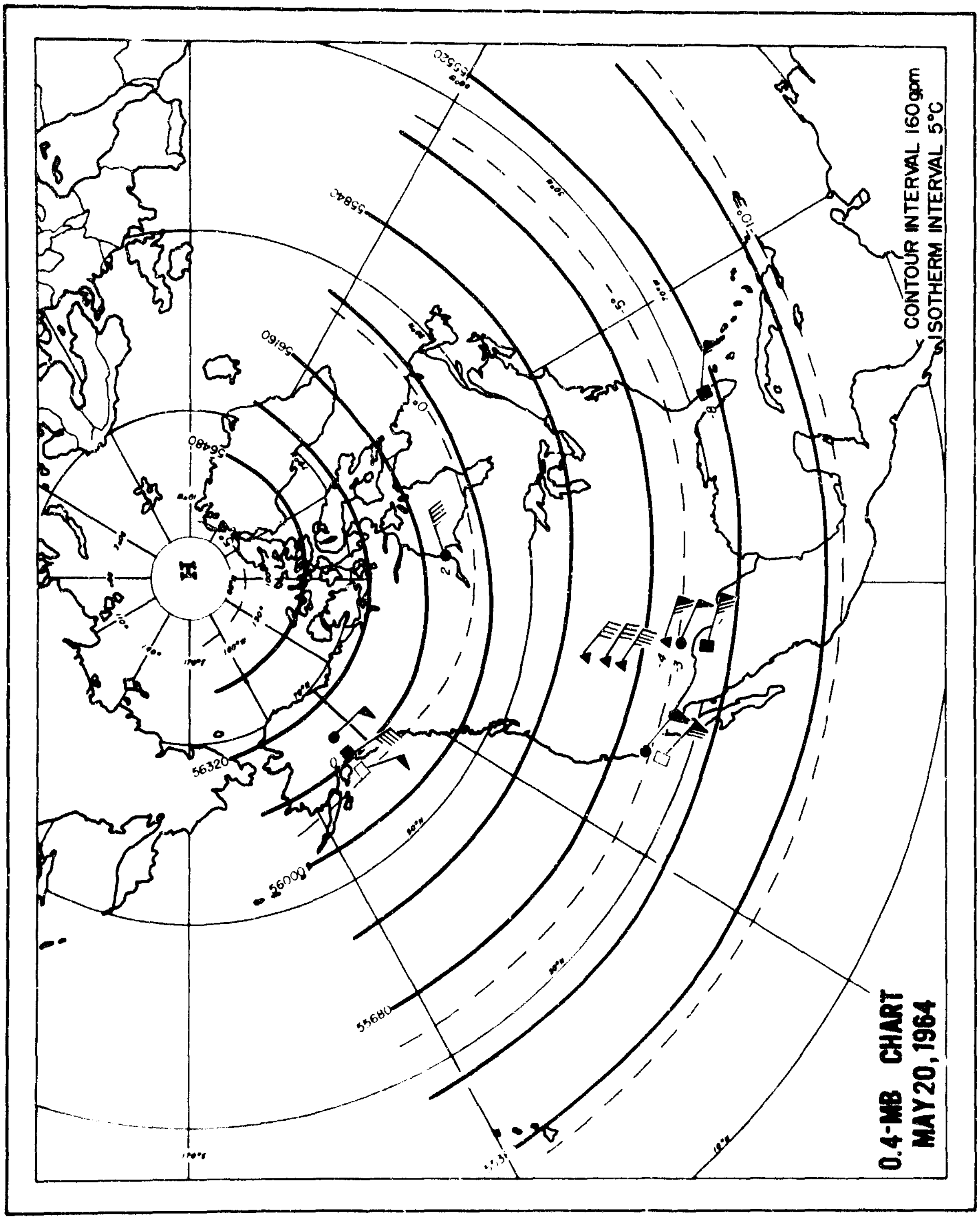
2-MB CHART
MAY 13, 1964
CONTOUR INTERVAL 80gpm
ISOTHERM INTERVAL 5°C
43040
43200
43360
43440
43280
43120
42960
42960
42880

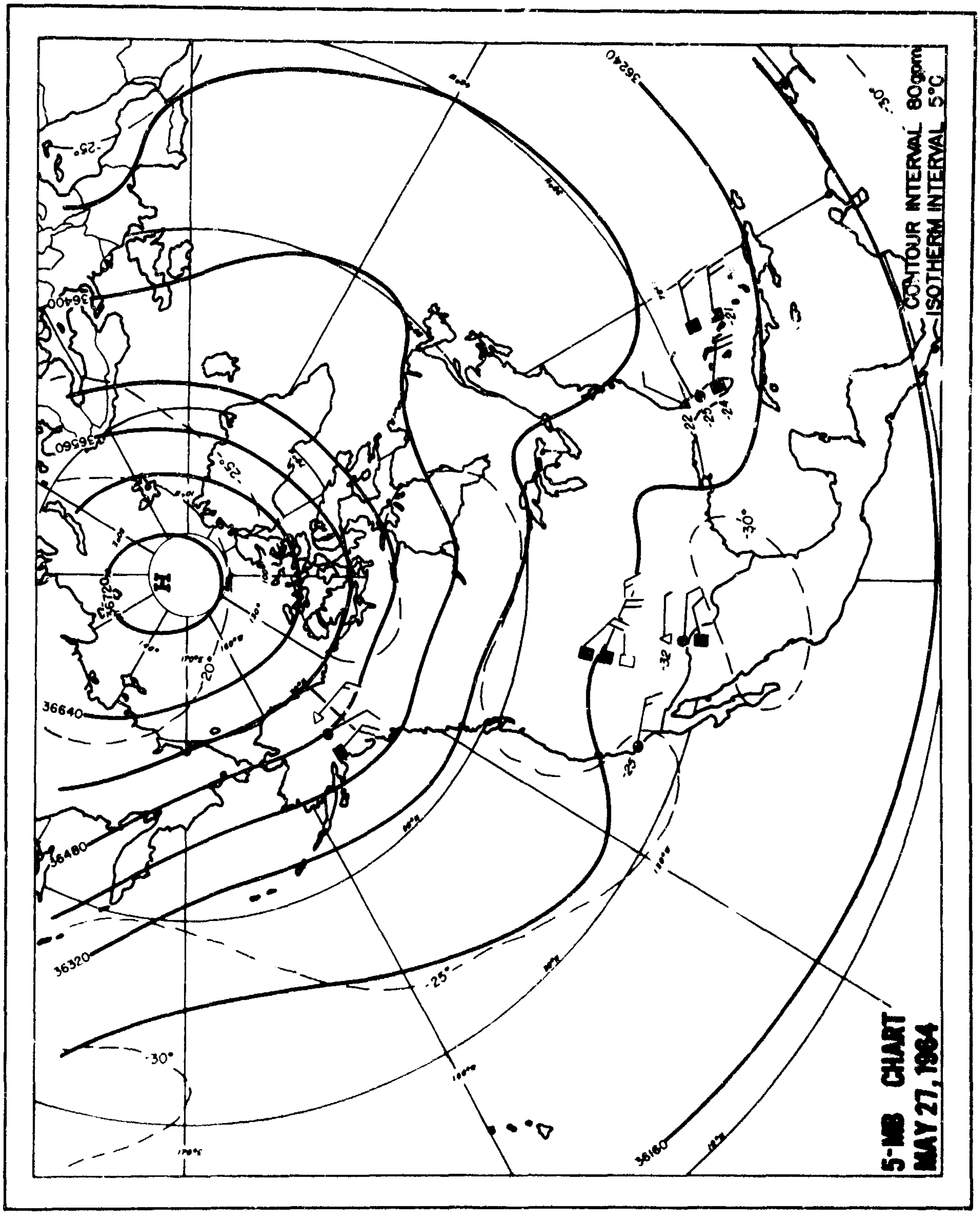


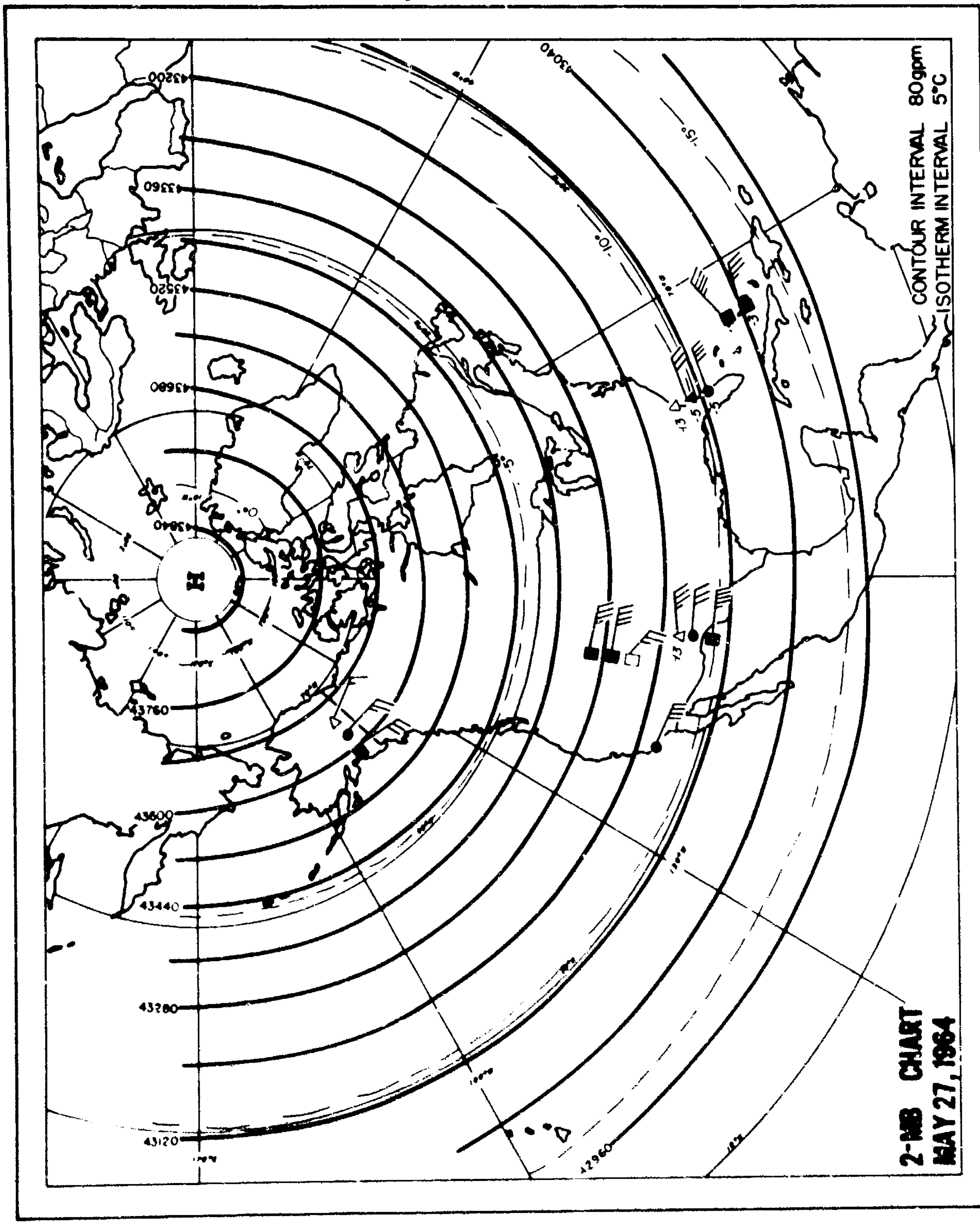
0.4-MB CHART
MAY 13, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
55840
56160
56480
56320
56000
55680
55520
55360
-7
10°

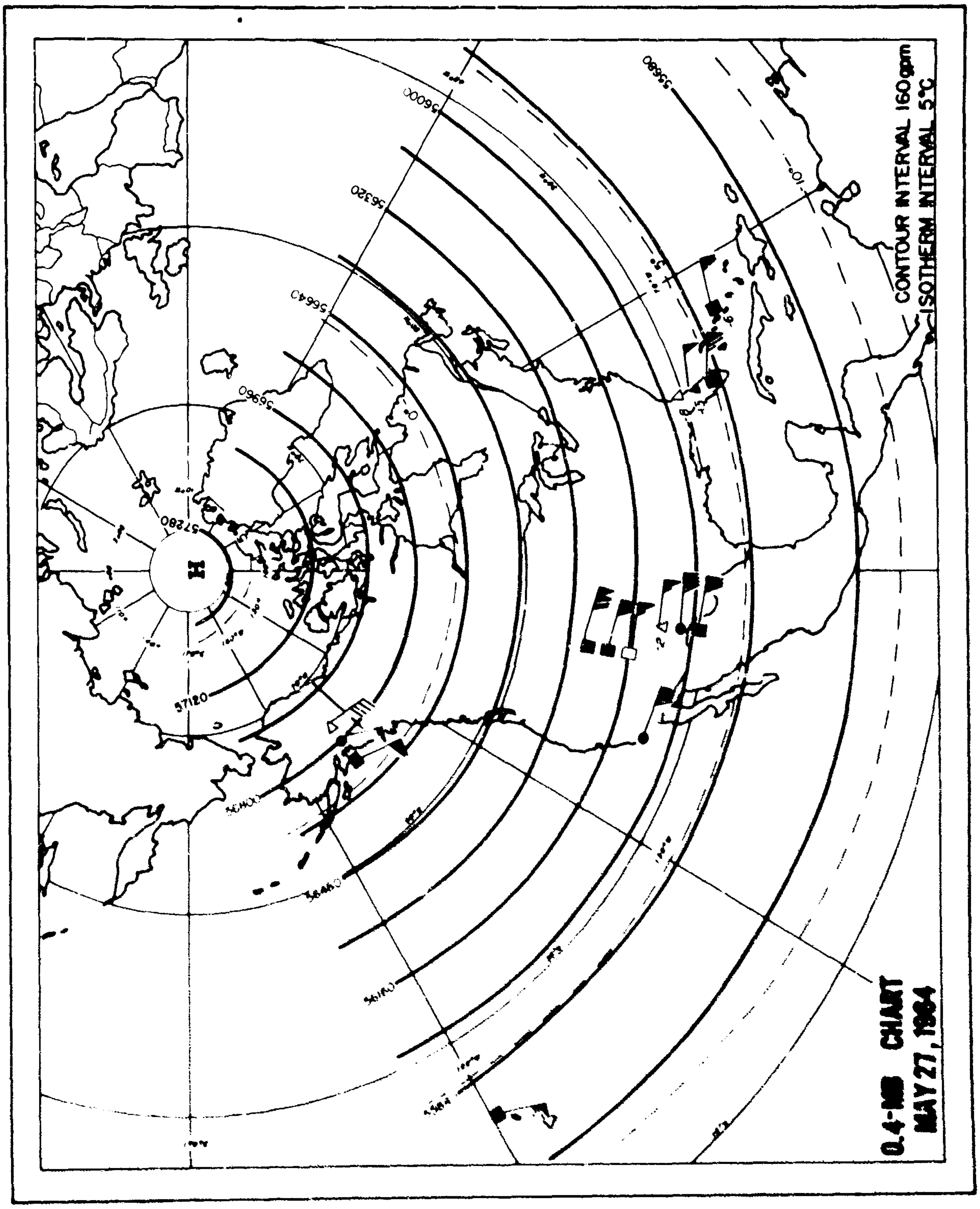

5-MB CHART
MAY 20, 1964
CONTOUR INTERVAL 80 gpm
ISOTHERM INTERVAL 5°C

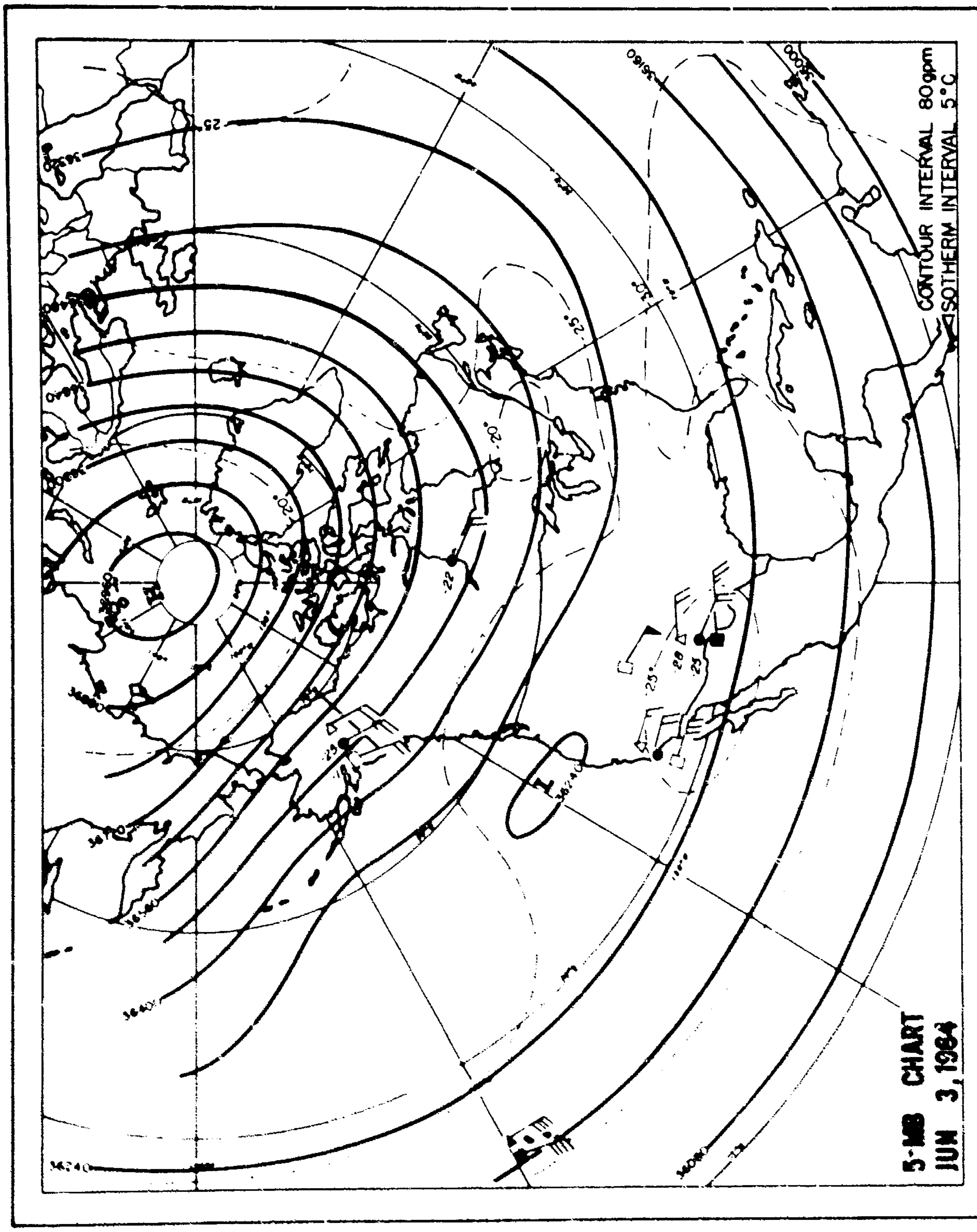

2-MB CHART
MAY 20, 1964
CONTOUR INTERVAL 80gpm
ISOTHERM INTERVAL 5°C
43120
43280
43440
43600
43520
43360
43200
43040
42960
42880
H
-5°
-10°
-15°

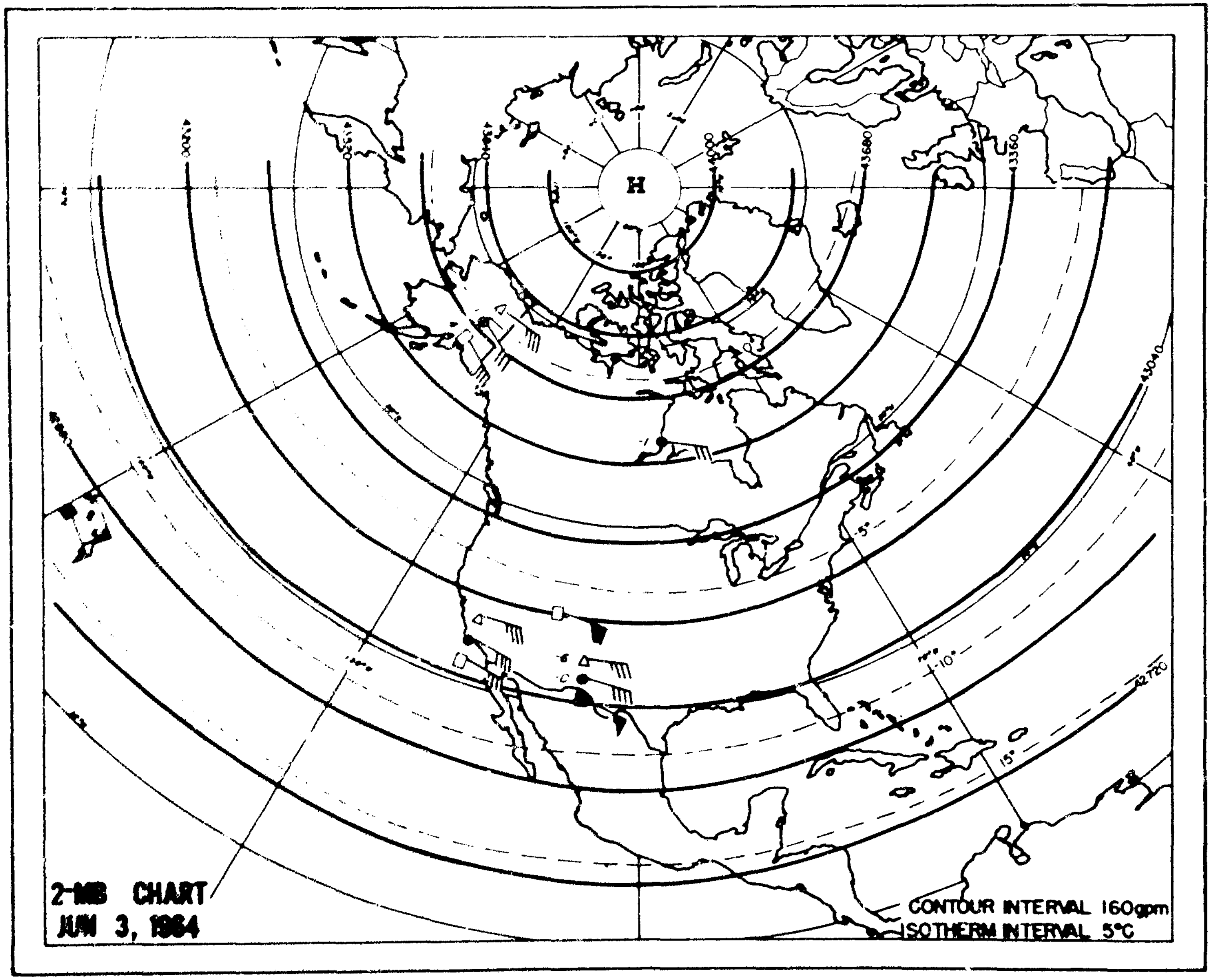

0.4-MB CHART
MAY 20, 1964
CONTOUR INTERVAL 160 gpm
ISOTHERM INTERVAL 5°C
55520
55840
56160
56480
56320
56000
55680
H
0°
-5°
-10°

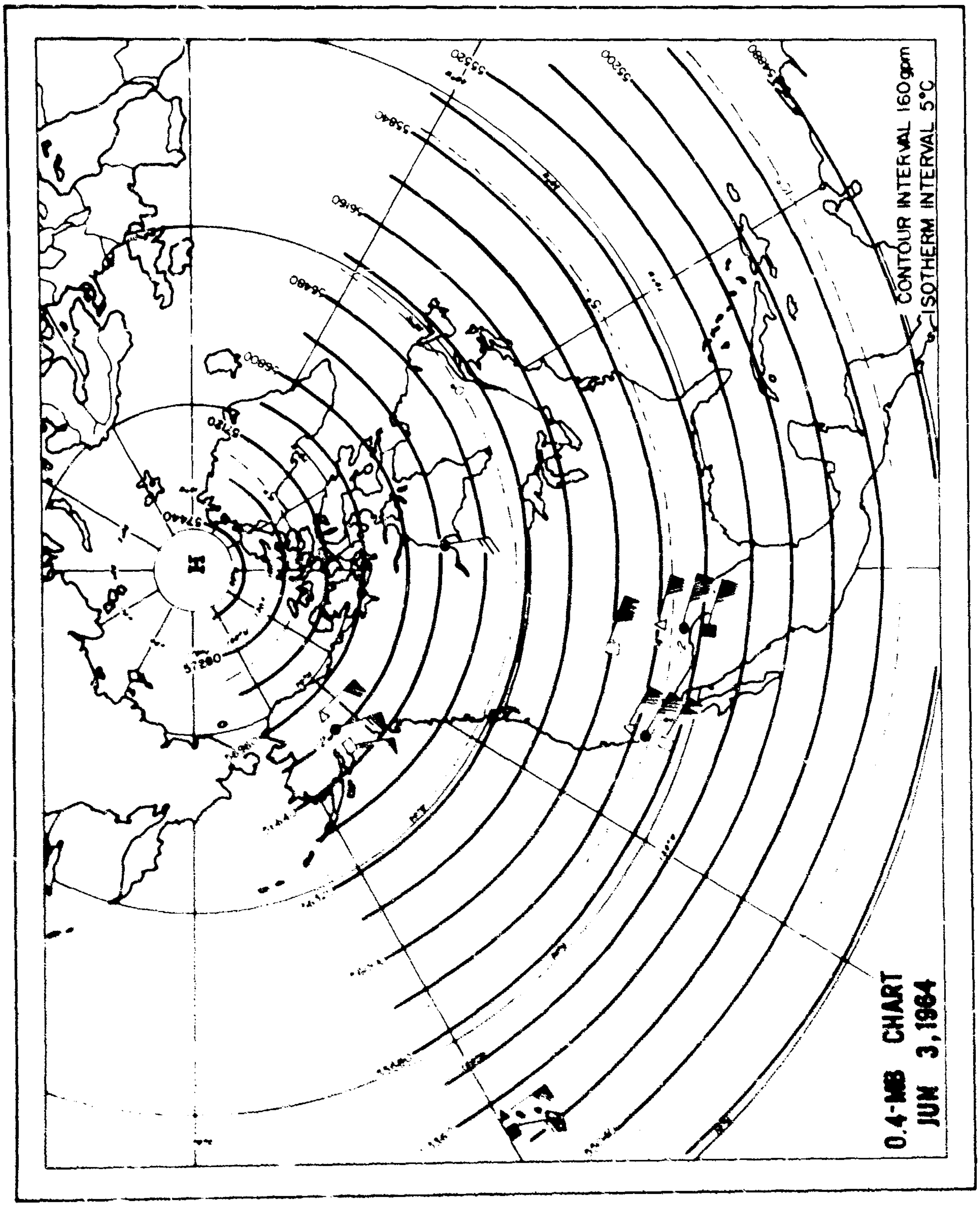

5-MB CHART
MAY 27, 1964
CONTOUR INTERVAL 80gpm
ISOTHERM INTERVAL 5°C
36240
36400
36560
36120
36640
36480
36320
36160
-25°
-30°


2-MB CHART
MAY 27, 1964
CONTOUR INTERVAL 80gpm
ISOTHERM INTERVAL 5°C
43200
43360
43520
43680
43840
43760
43600
43440
43280
43120
43040
42960
-15
-10
-5
H


0.4-MB CHART
MAY 27, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
H
57280
57120
56960
56640
56320
56000
55680


5-MB CHART
JUN 3, 1964
CONTOUR INTERVAL 80 gpm
ISOTHERM INTERVAL 5°C


2-MB CHART
JUN 3, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
H
43680
43360
43040
42720
44000
43520
43200
-5°
-10°
15°


0.4-MB CHART
JUN 3,1964
CONTOUR INTERVAL 160 gpm
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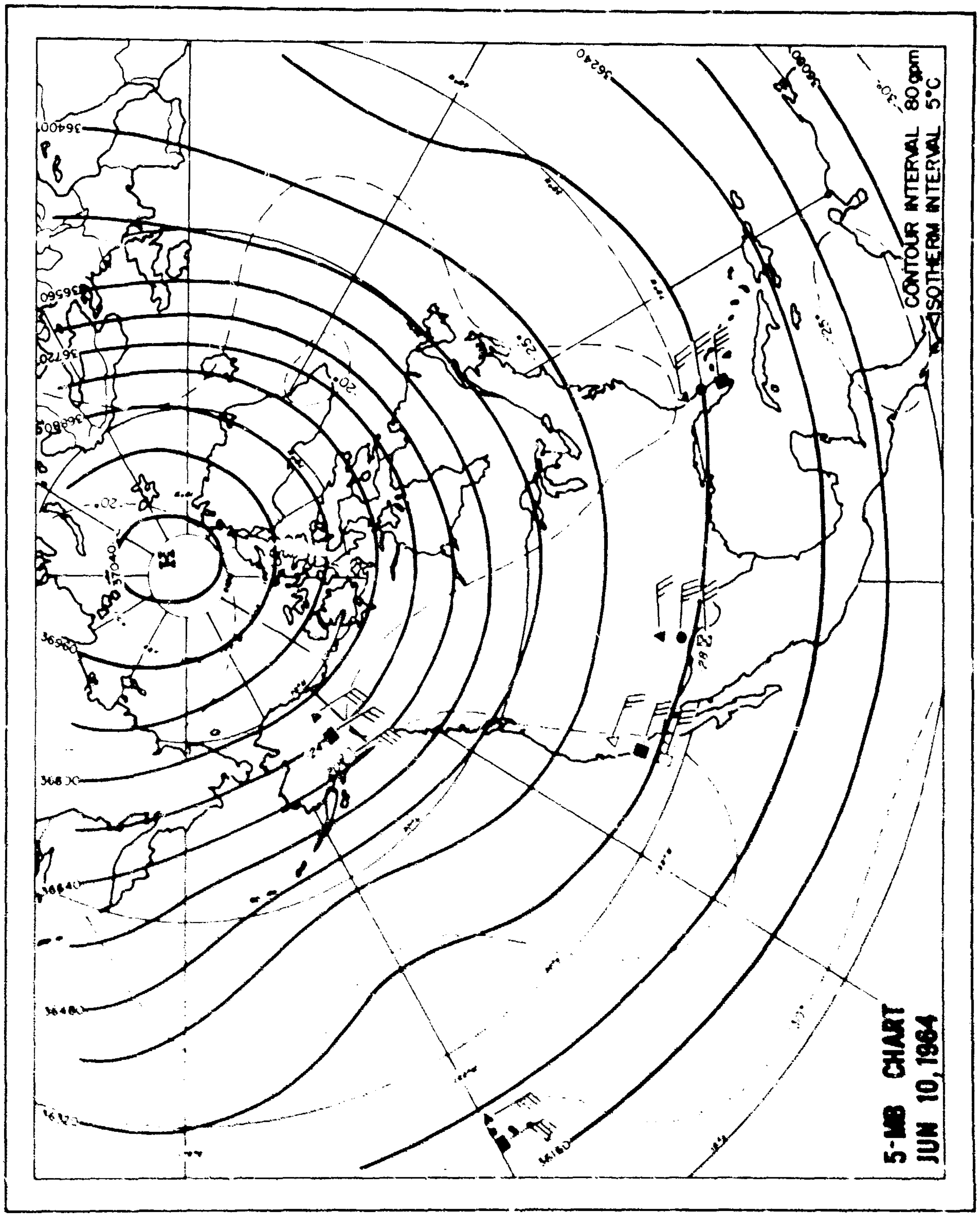
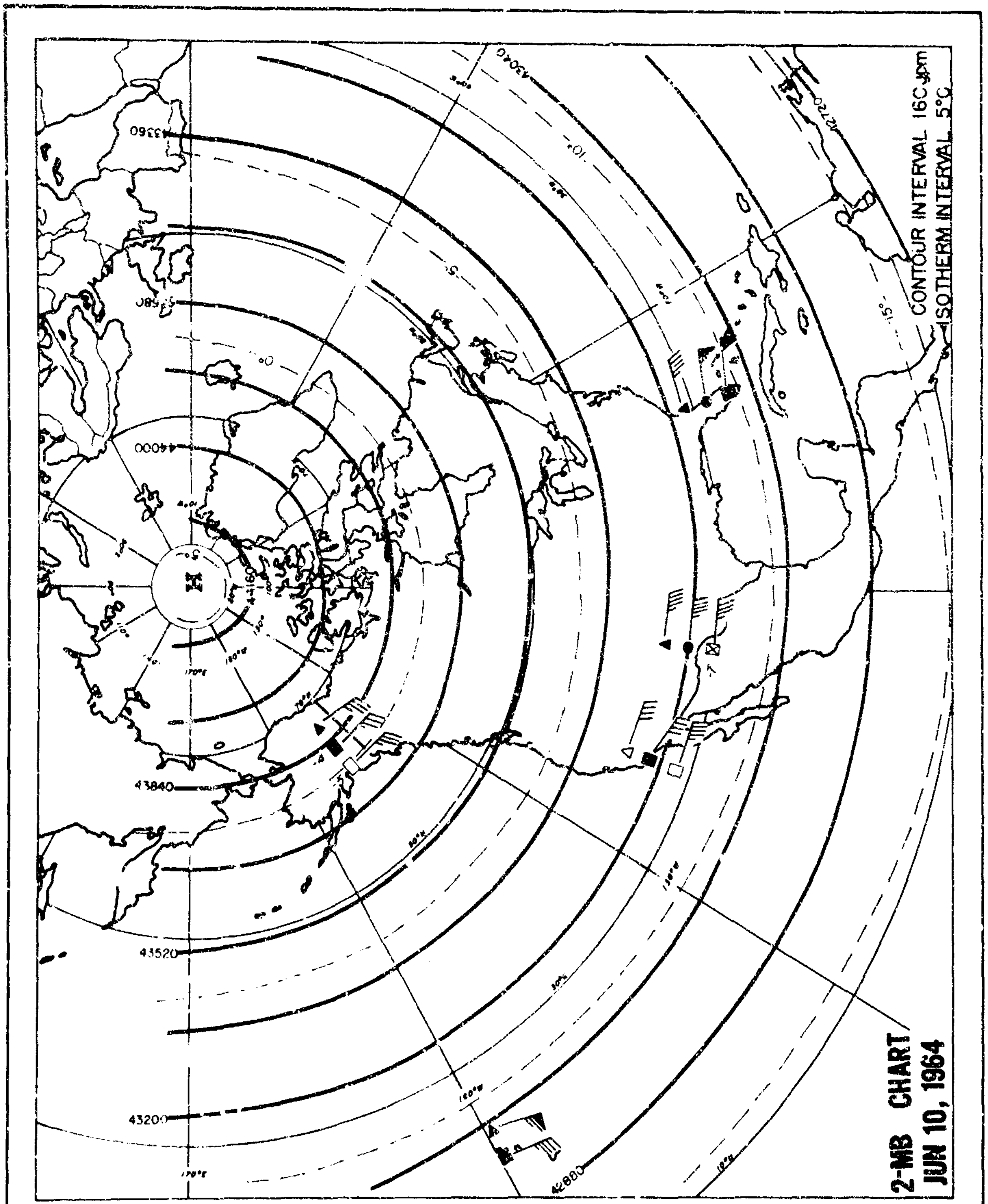
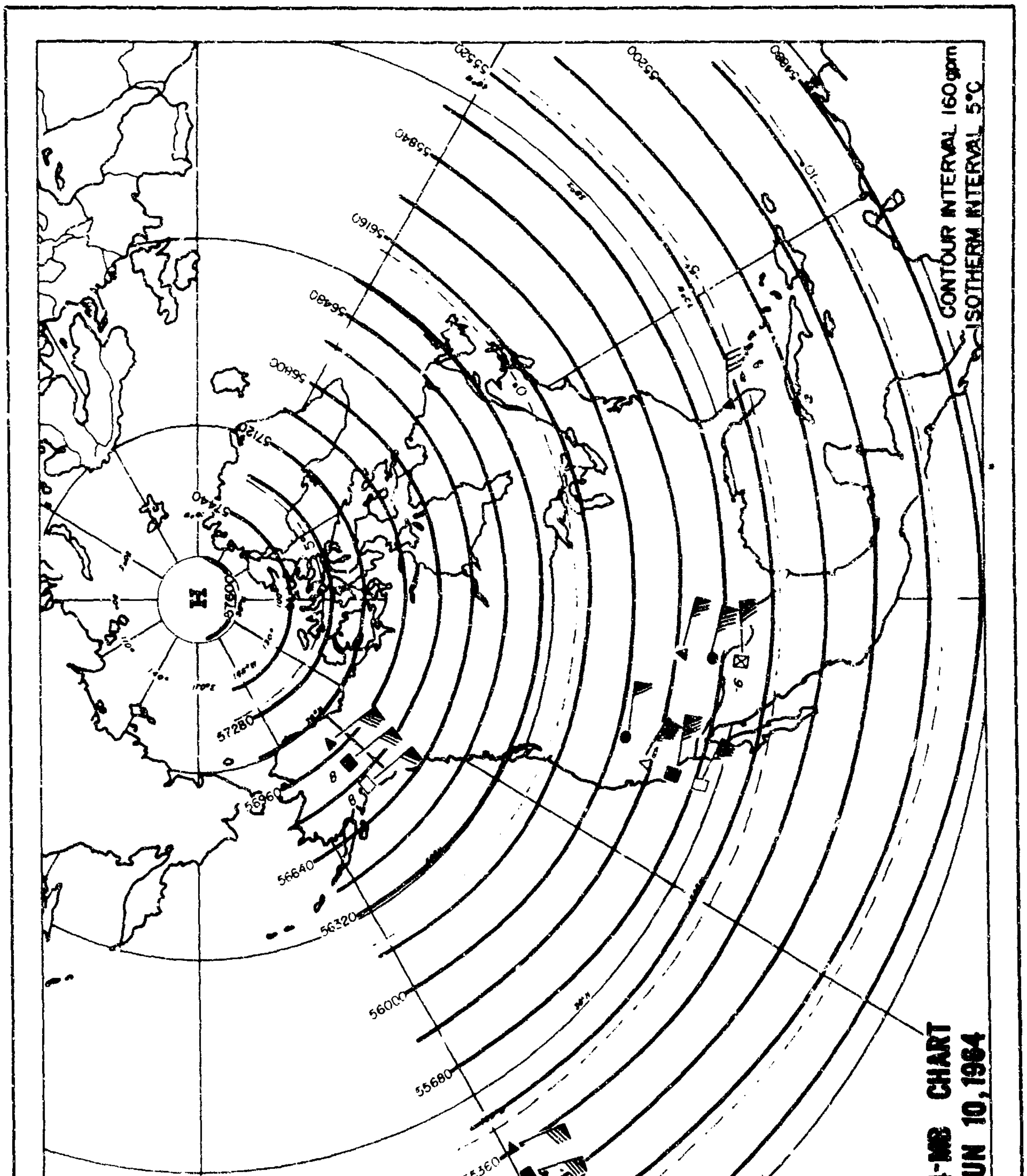
H
57440
57280
57120
56800
56480
56160
55840
55520
55200
54880


5-MB CHART
JUN 10, 1964
CONTOUR INTERVAL 80 gpm
ISOTHERM INTERVAL 5°C



2-MB CHART
JUN 10, 1964
CONTOUR INTERVAL 160 gpm
ISOTHERM INTERVAL 5°C
44000
43840
43520
43200
42880


0.4-MB CHART
JUN 10, 1964
CONTOUR INTERVAL 160 gpm
ISOTHERM INTERVAL 5°C
57280
56960
56640
56320
56000
55680
55360
55040
57440
57120
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56480
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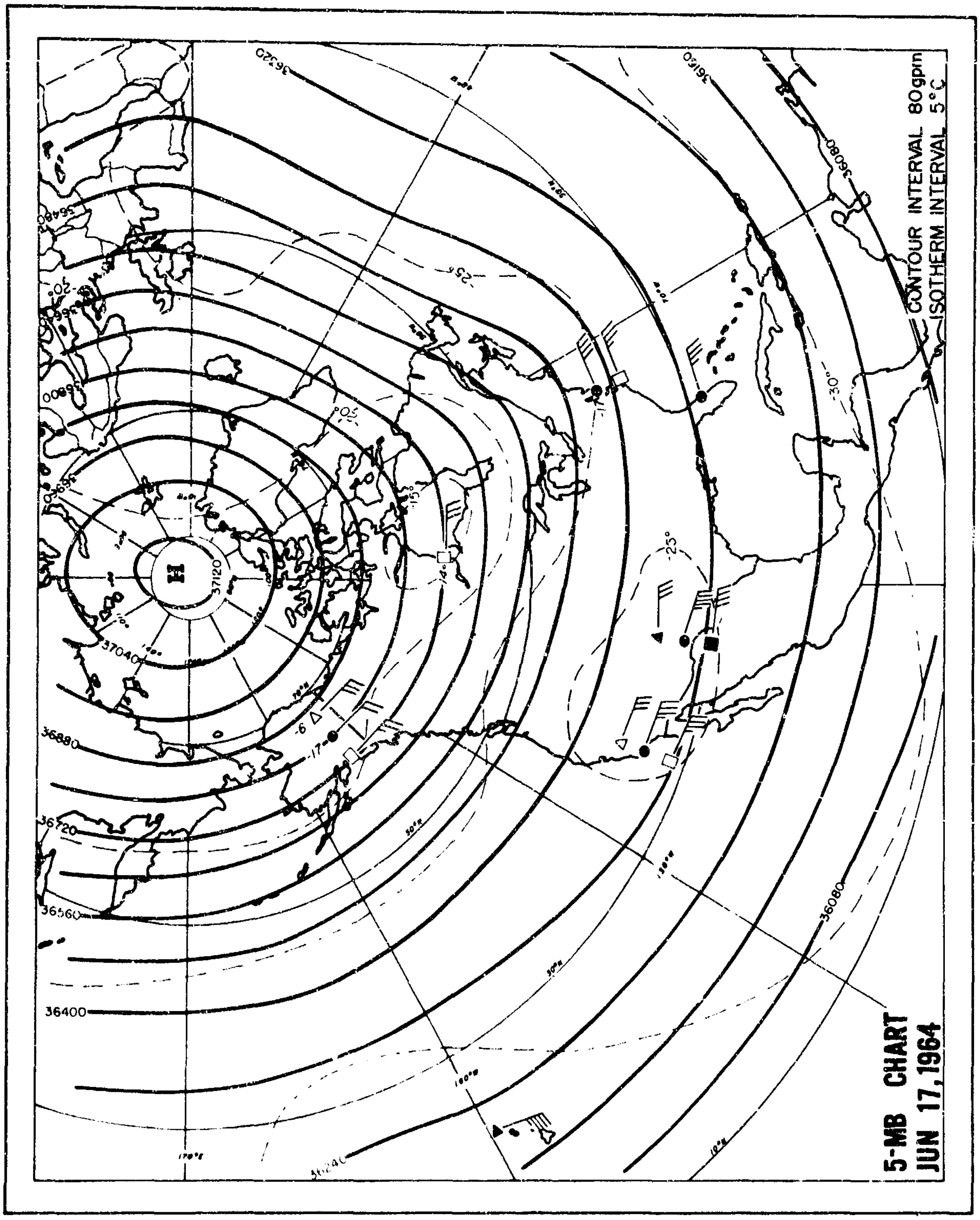
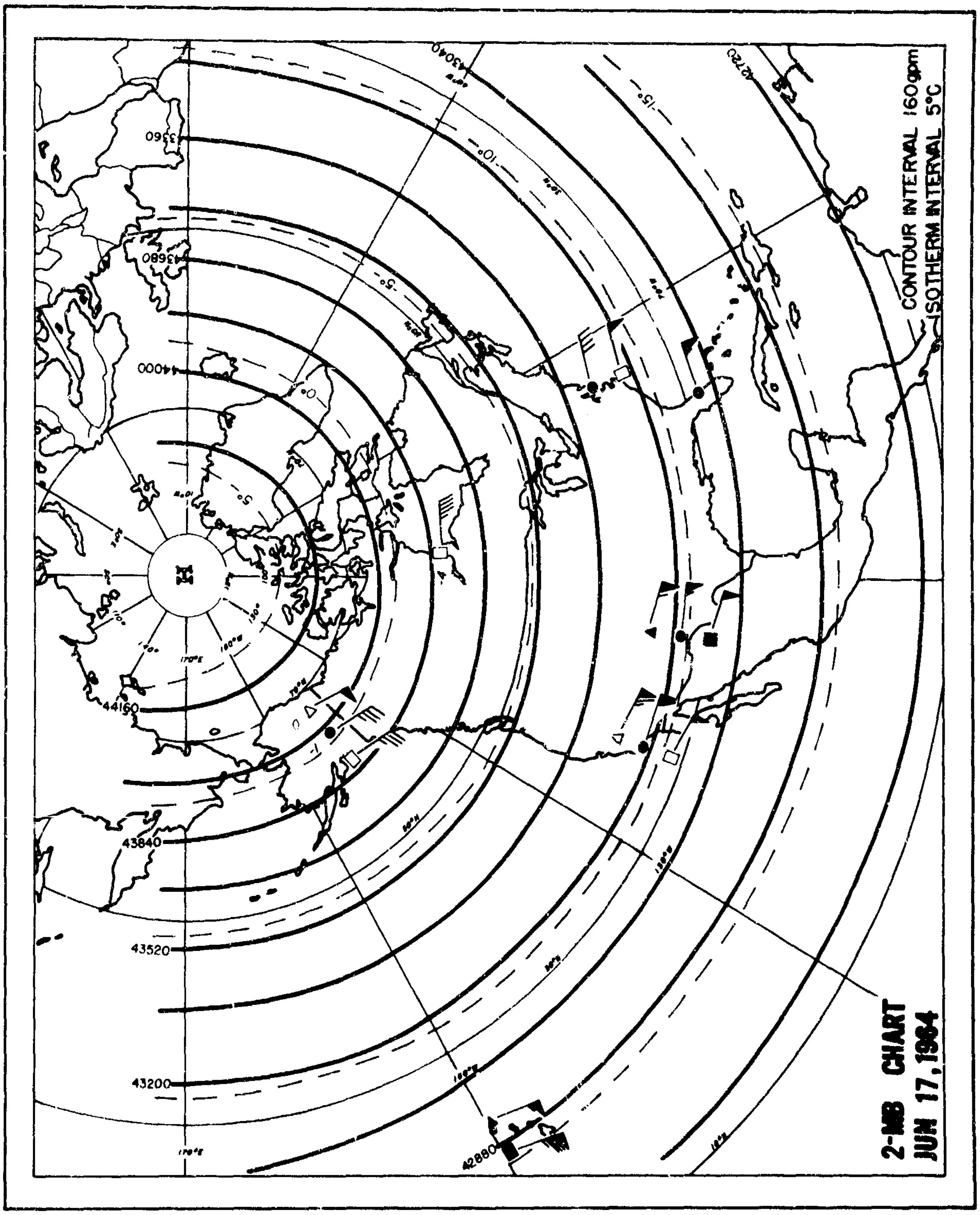
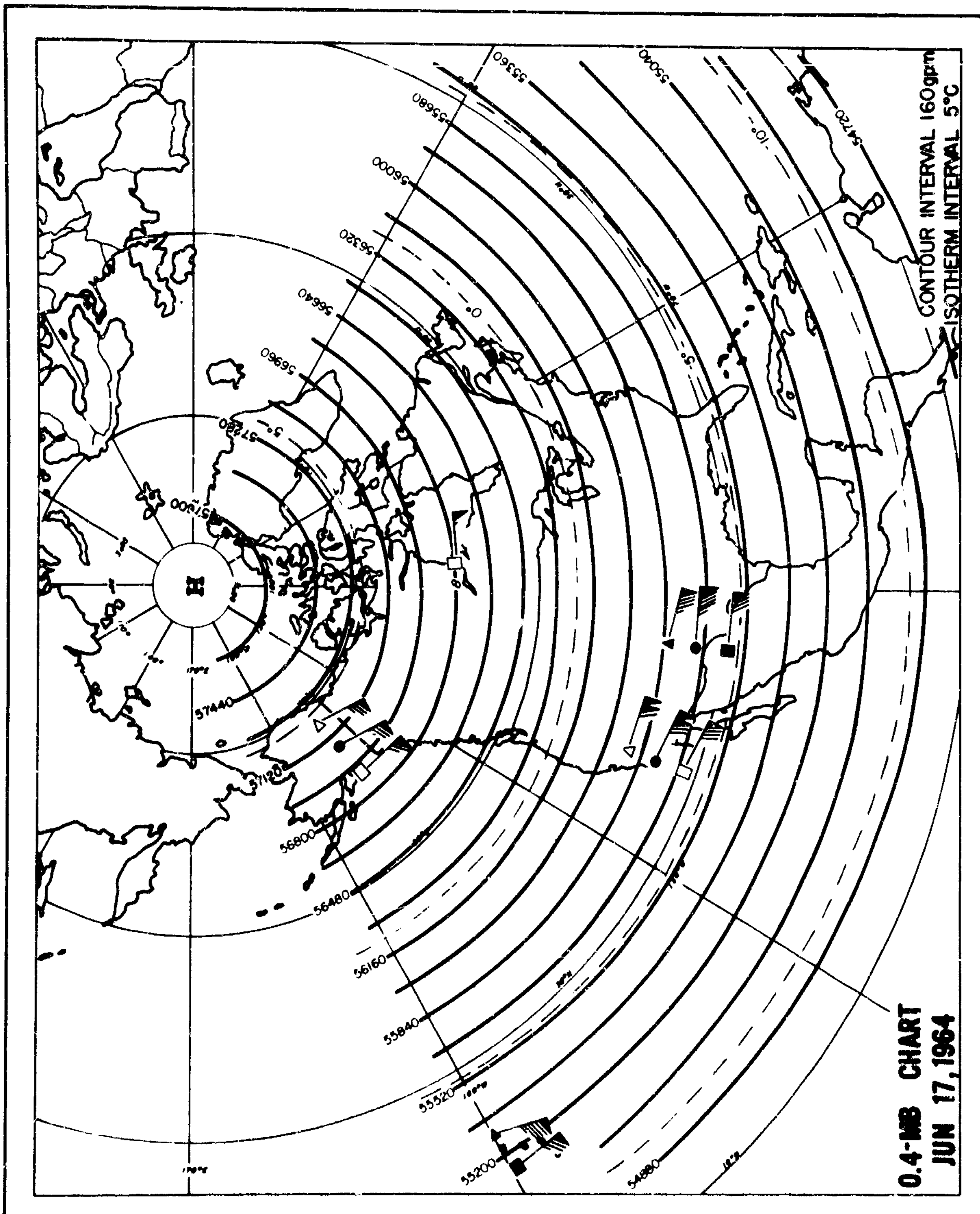
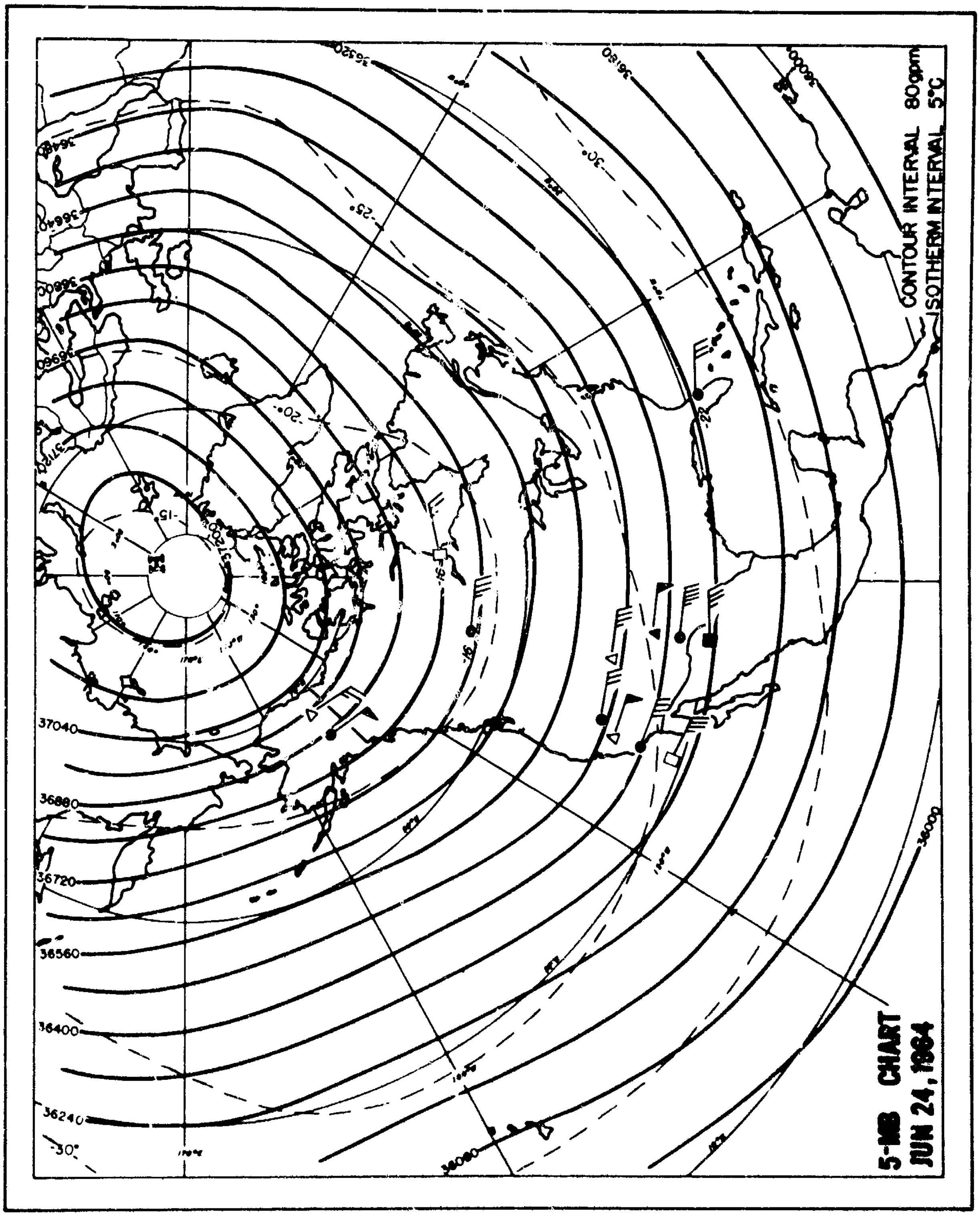
55840
55520
55200
54880

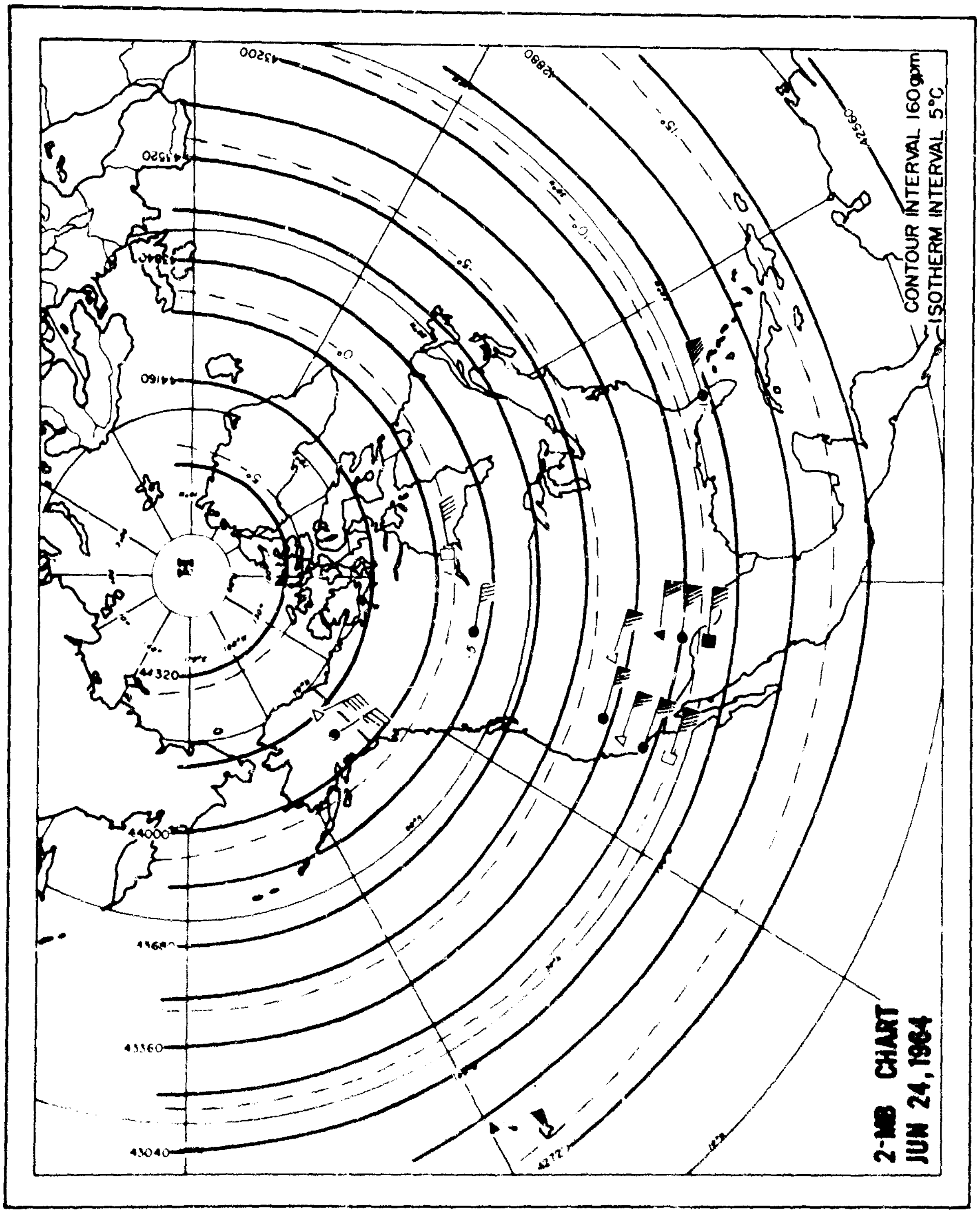

5-MB CHART
JUN 17, 1964
CONTOUR INTERVAL 80gpm
ISOTHERM INTERVAL 5°C
36400
36560
36720
36880
37040
37120
36080
36120
36320

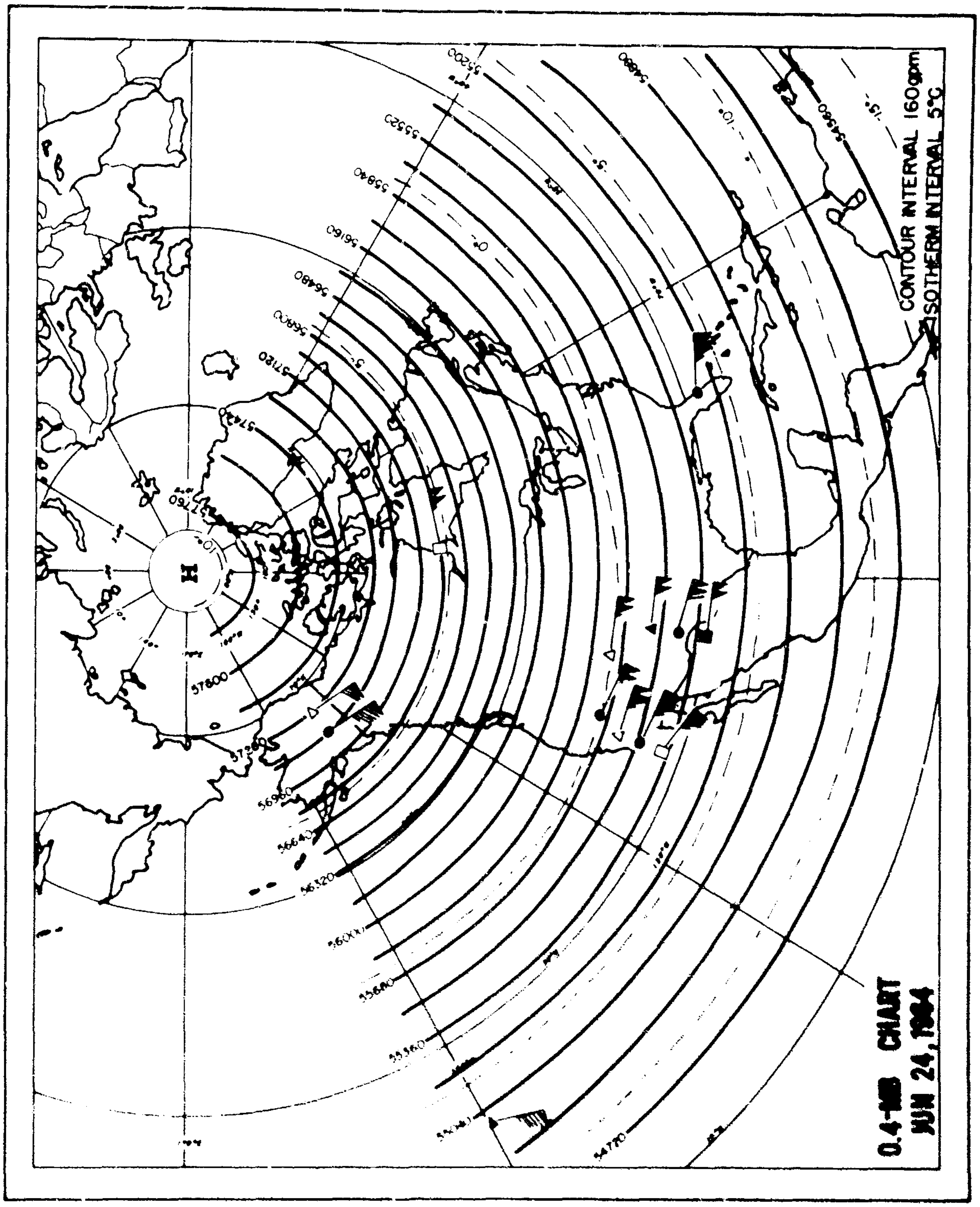

CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
2-MB CHART
JUN 17, 1964
43360
43680
44000
44160
43840
43520
43200
42880
43040
42720

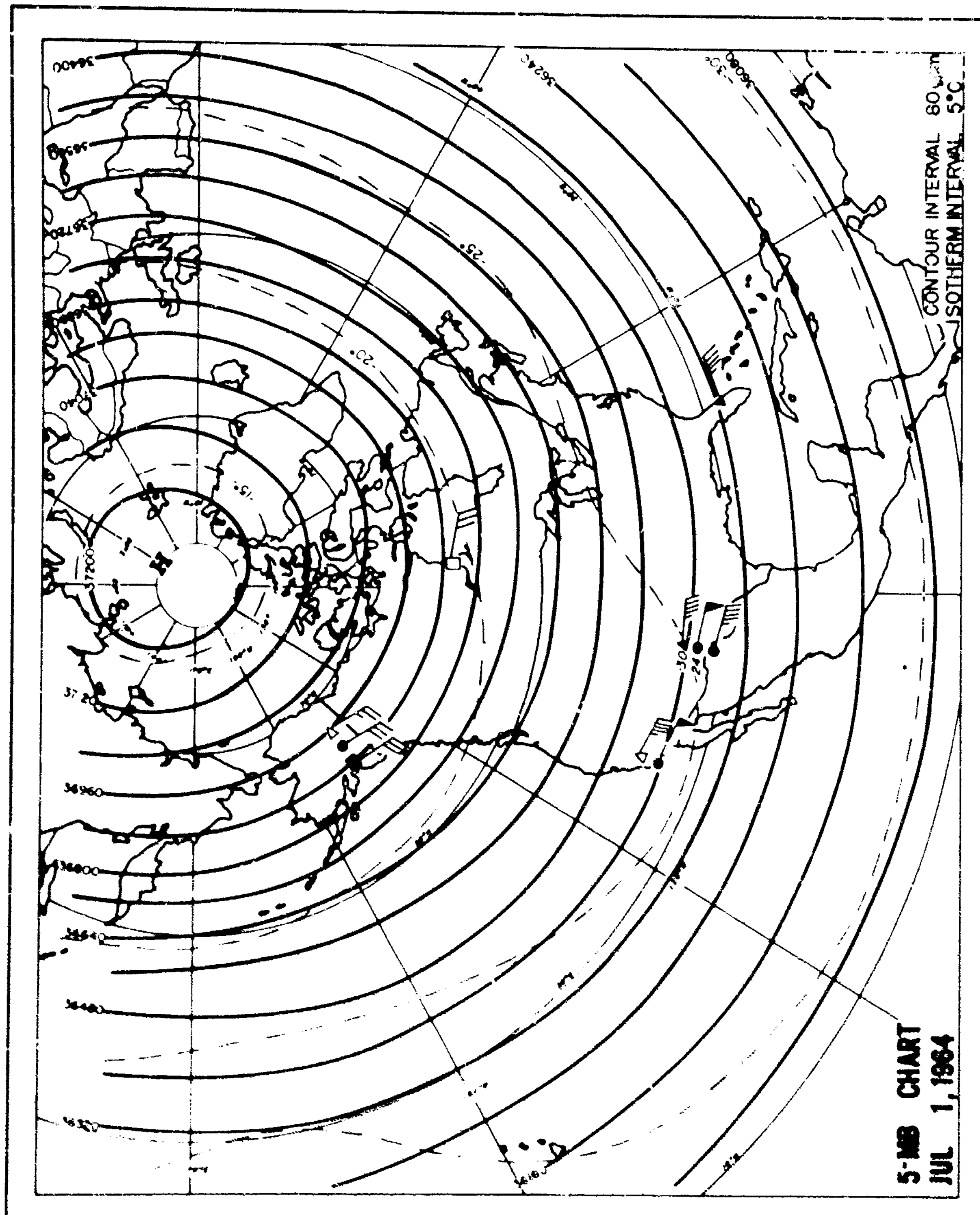

0.4-MB CHART
JUN 17, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C

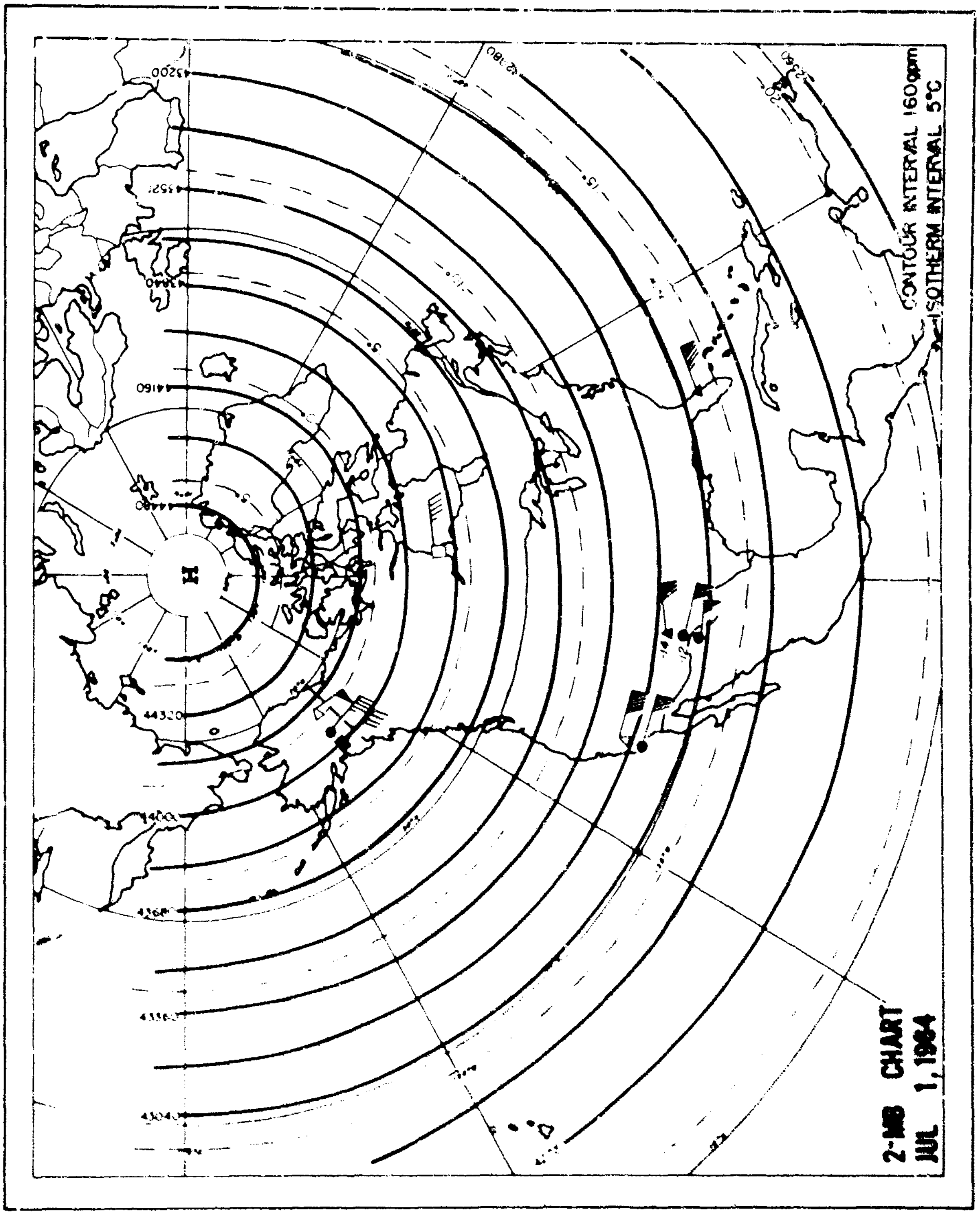


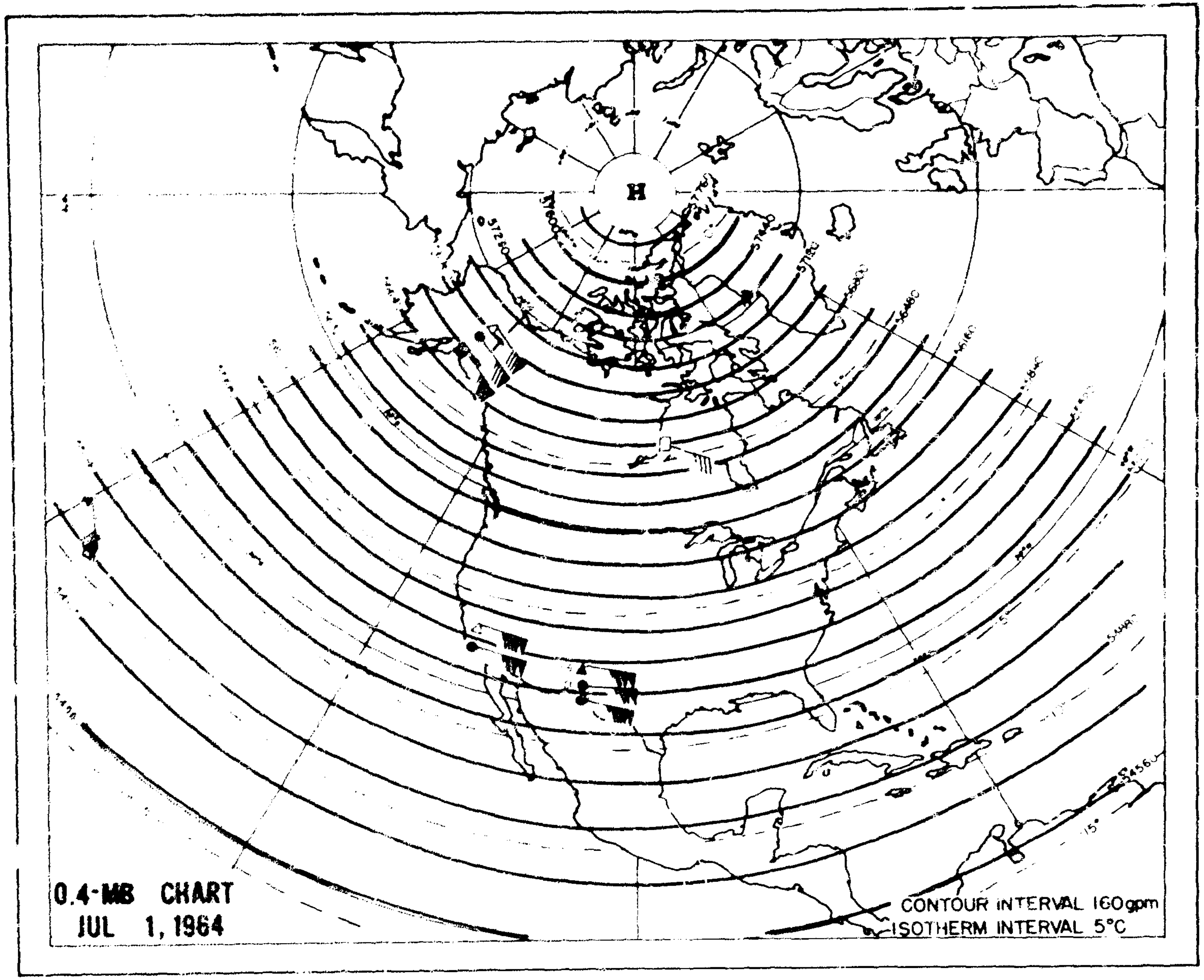
5-MB CHART
JUN 24, 1964
CONTOUR INTERVAL 80gpm
ISOTHERM INTERVAL 5°C
37040
36880
36720
36560
36400
36240
36080
36000
-30°
-25°
-20°
-15

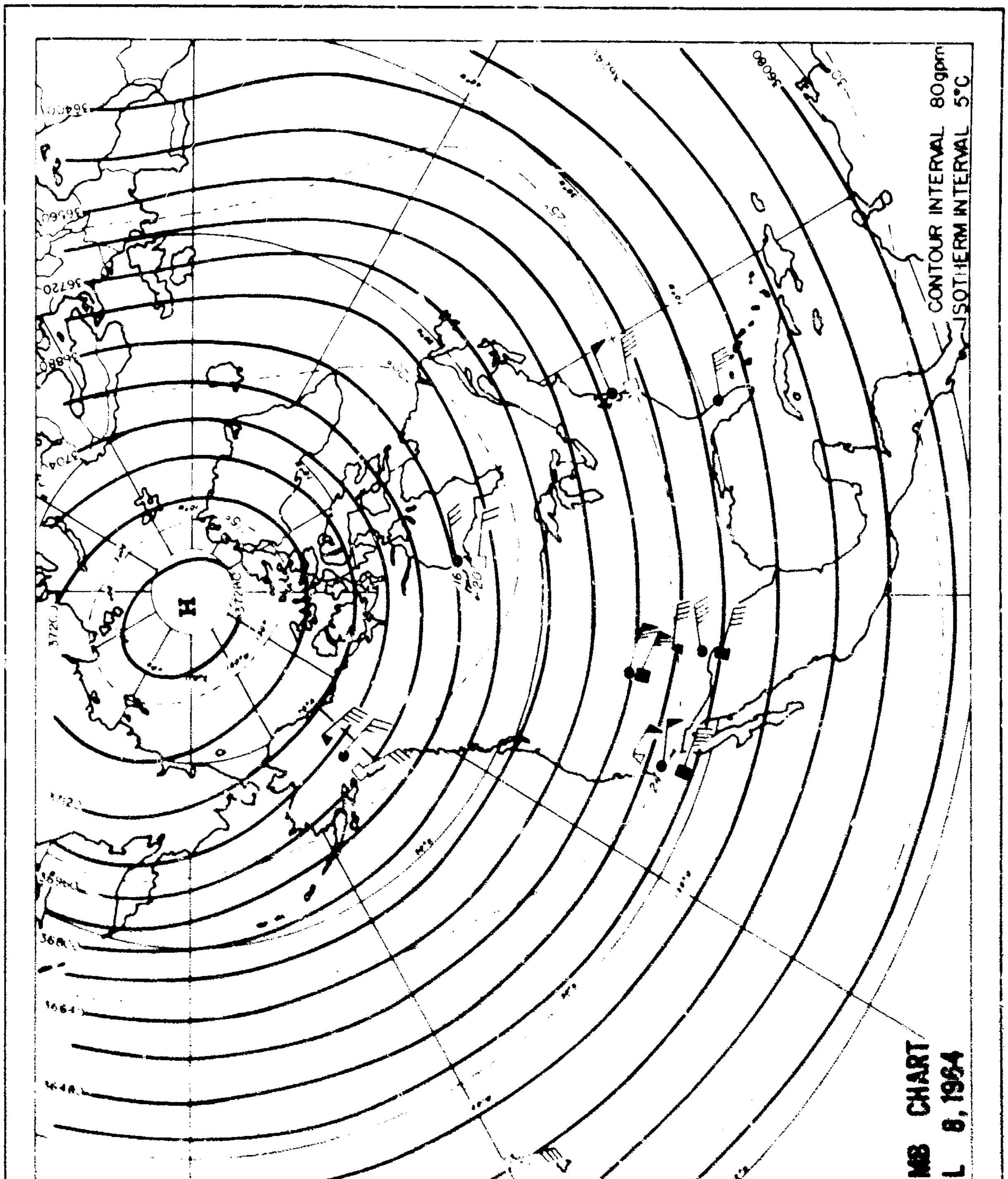

2-MB CHART
JUN 24, 1964
CONTOUR INTERVAL 160 gpm
ISOTHERM INTERVAL 5°C
43040
43360
44000
44320
44160
43520
43200
42880
42560

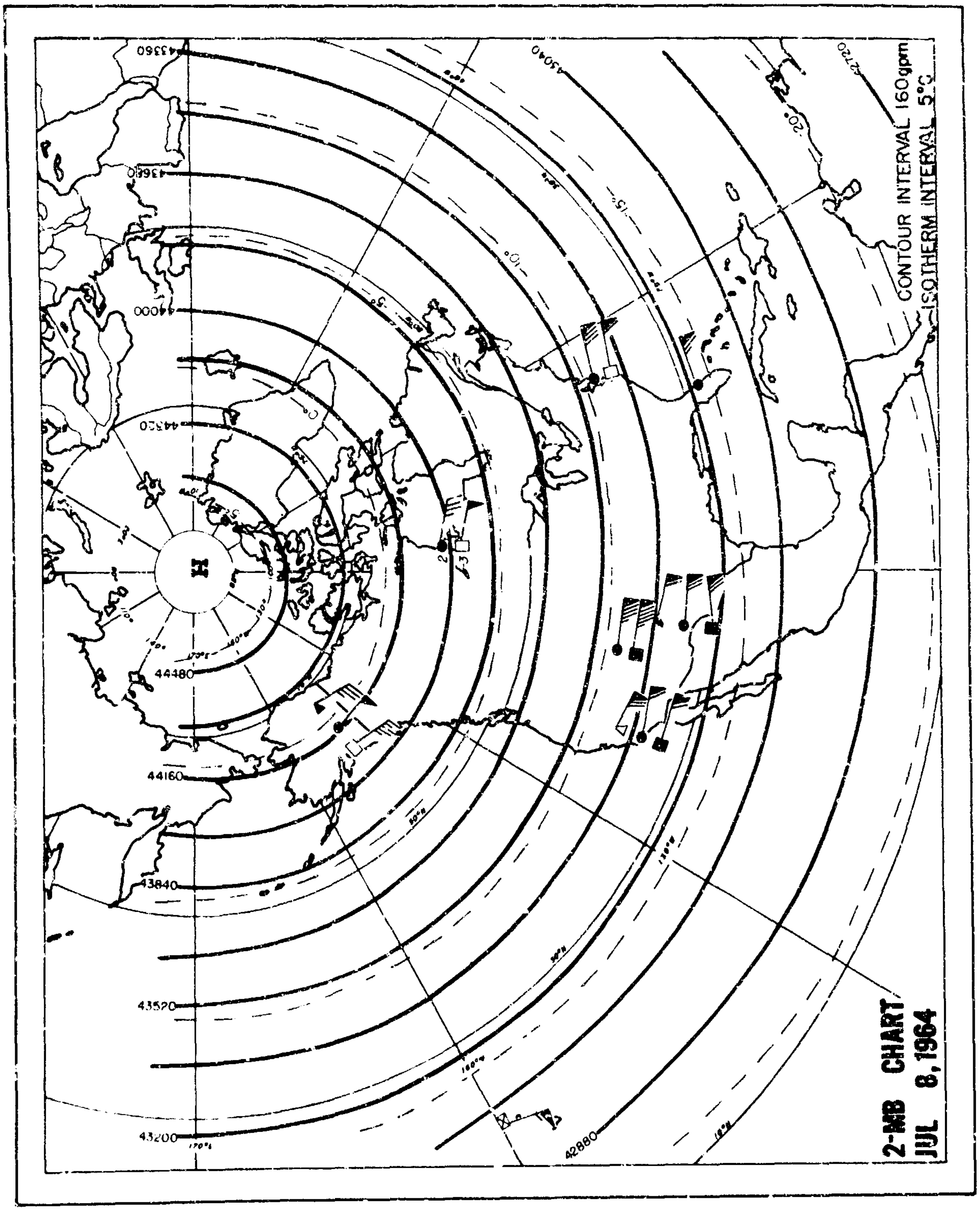

0.4-MB CHART
JUN 24, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C

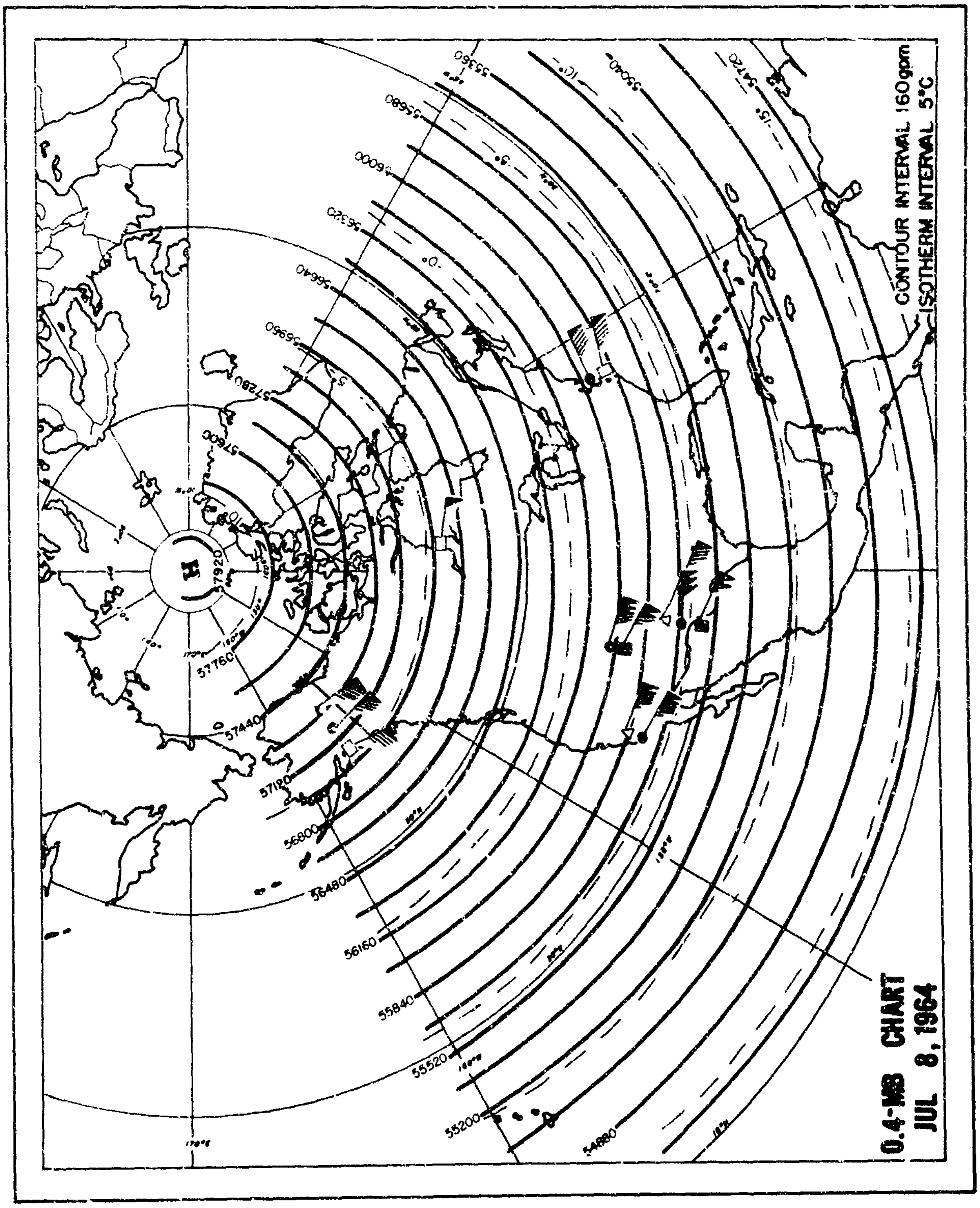

5-MB CHART
JUL 1, 1964
CONTOUR INTERVAL 60 m
ISOTHERM INTERVAL 5°C


2-MB CHART
JUL 1, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C


H
0.4-MB CHART
JUL 1, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C


5-MB CHART
JUL 8, 1964
CONTOUR INTERVAL 80gpm
ISOTHERM INTERVAL 5°C


2-MB CHART
JUL 8, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
44480
44160
43840
43520
43200
42880
44320
44000
43680
43360
42720
H


0.4-MB CHART
JUL 8, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
H
57920
57760
57440
57120
56800
56480
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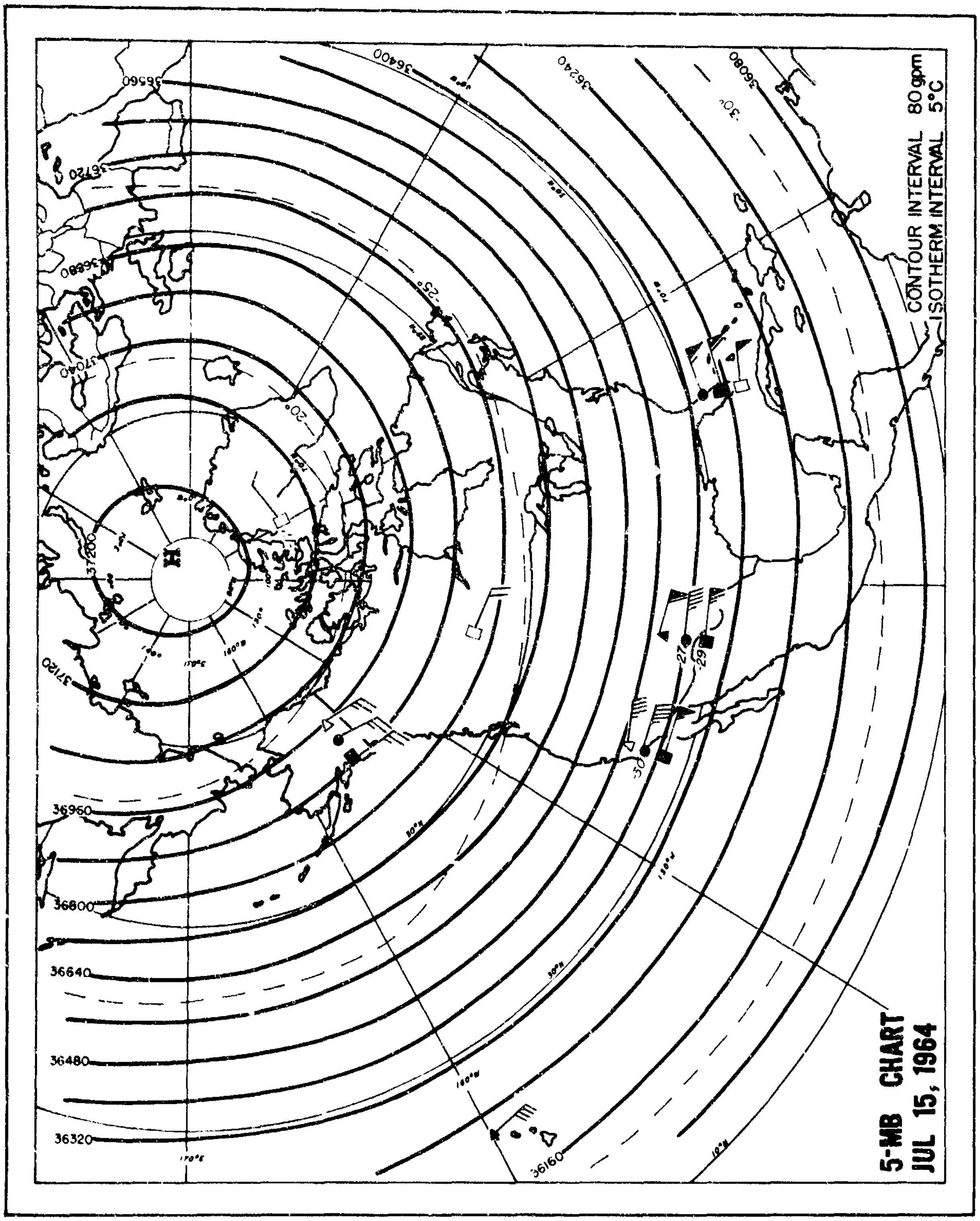
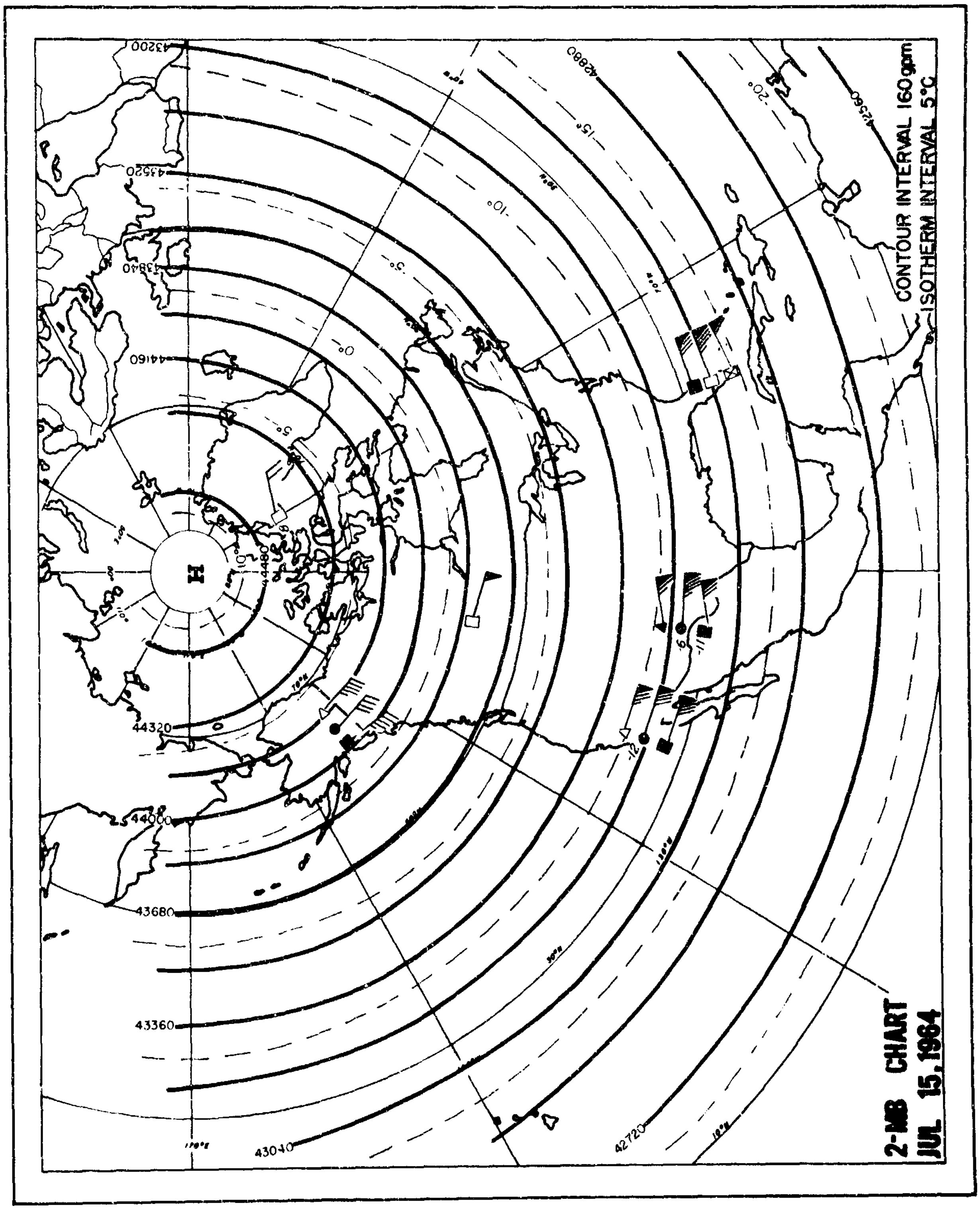
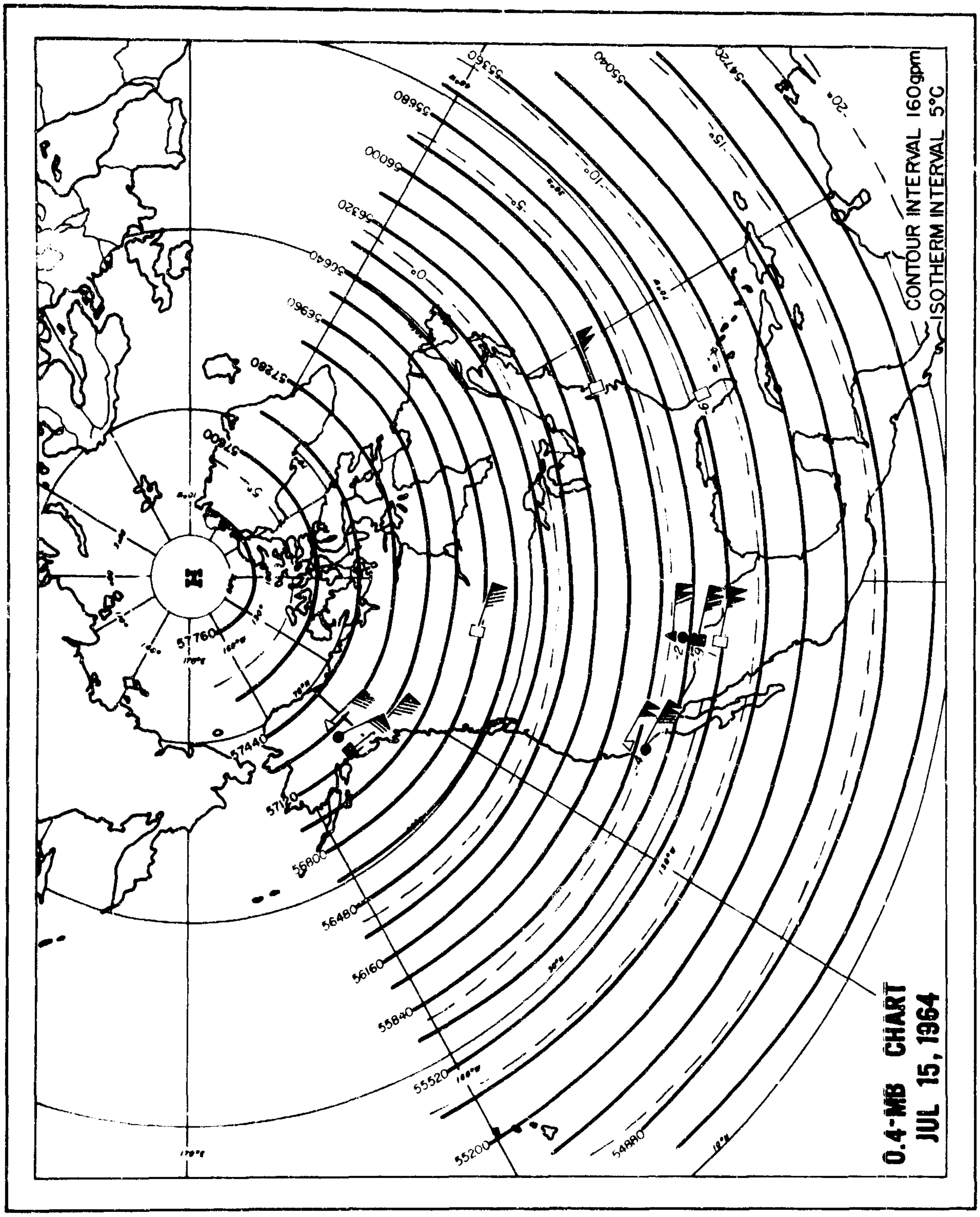
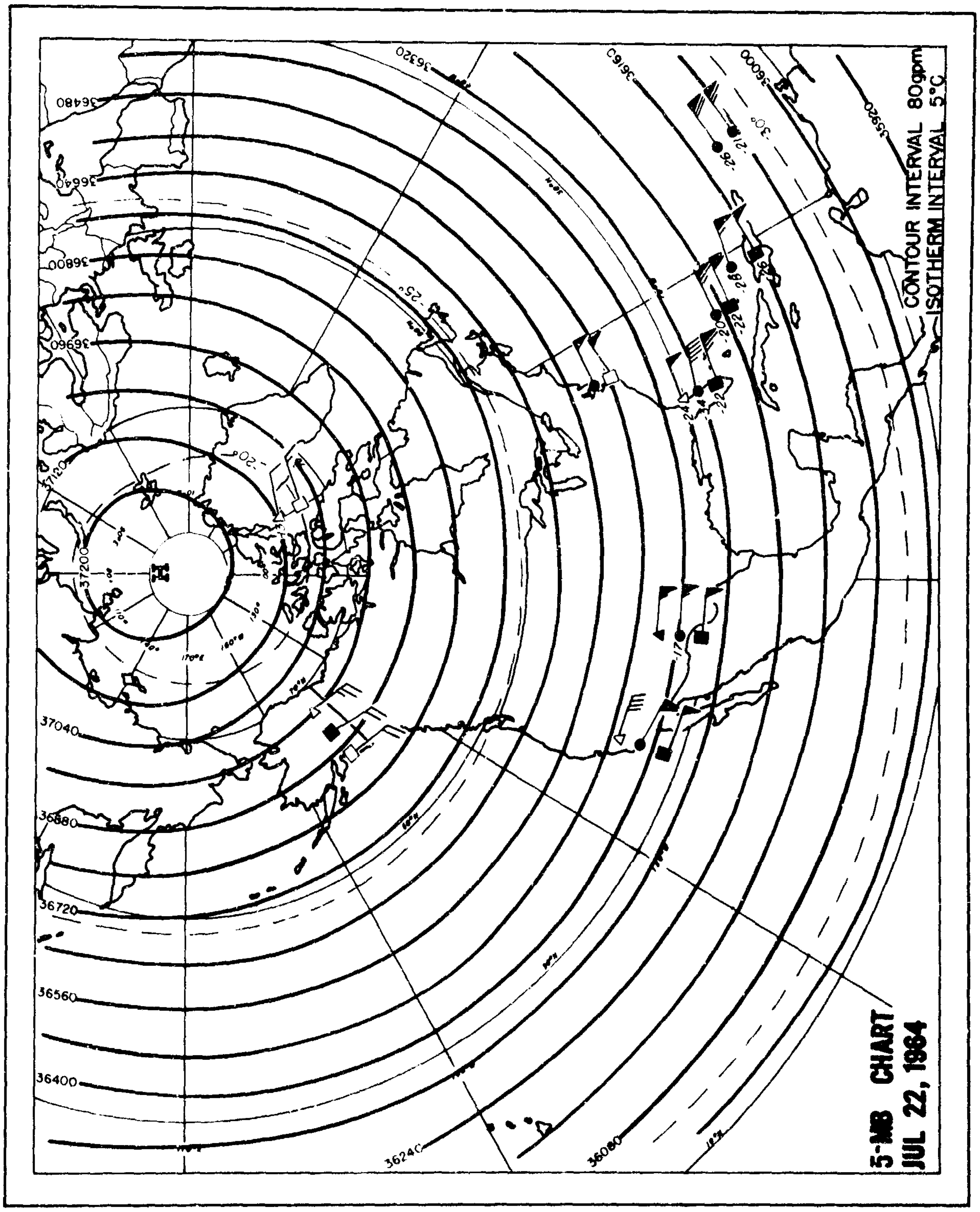
55680
55360
55040
54720


5-MB CHART
JUL 15, 1964
CONTOUR INTERVAL 80 gpm
ISOTHERM INTERVAL 5°C
36560
36720
36880
37040
37200
37120
36960
36800
36640
36480
36320
36160
36400
36240
36080
-20°
-25°
-30°


2-MB CHART
JUL 15, 1964
CONTOUR INTERVAL 160 gpm
ISOTHERM INTERVAL 5°C
43200
43520
43840
44160
44480
44320
44000
43680
43360
43040
42720
42880
42560
-20°
-15°
-10°
-5°
0°
5°
10°
H


0.4-MB CHART
JUL 15, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C


5-MB CHART
JUL 22, 1964
CONTOUR INTERVAL 80gpm
ISOTHERM INTERVAL 5°C
36480
36640
36800
36960
37120
37200
37040
36880
36720
36560
36400
36240
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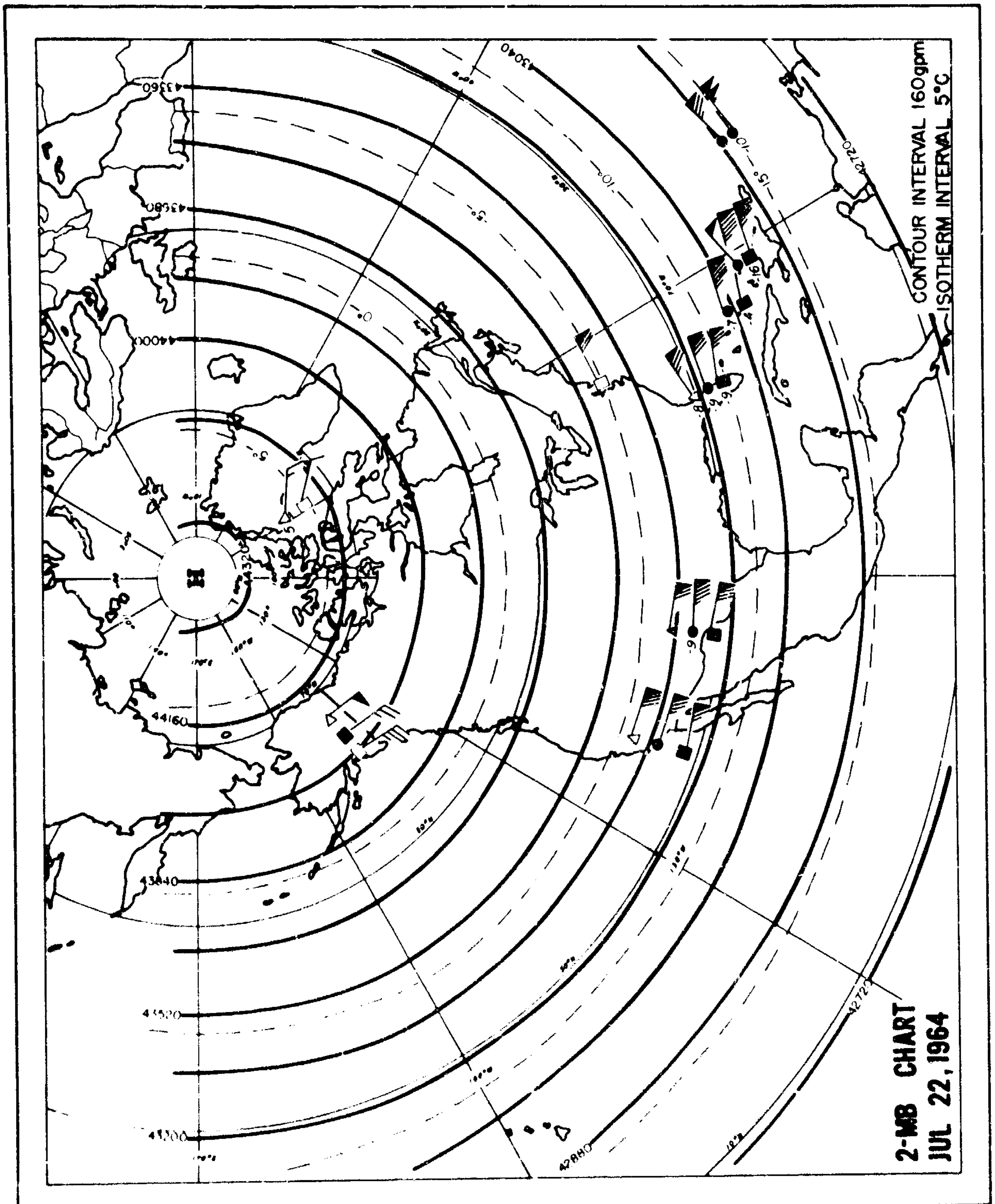
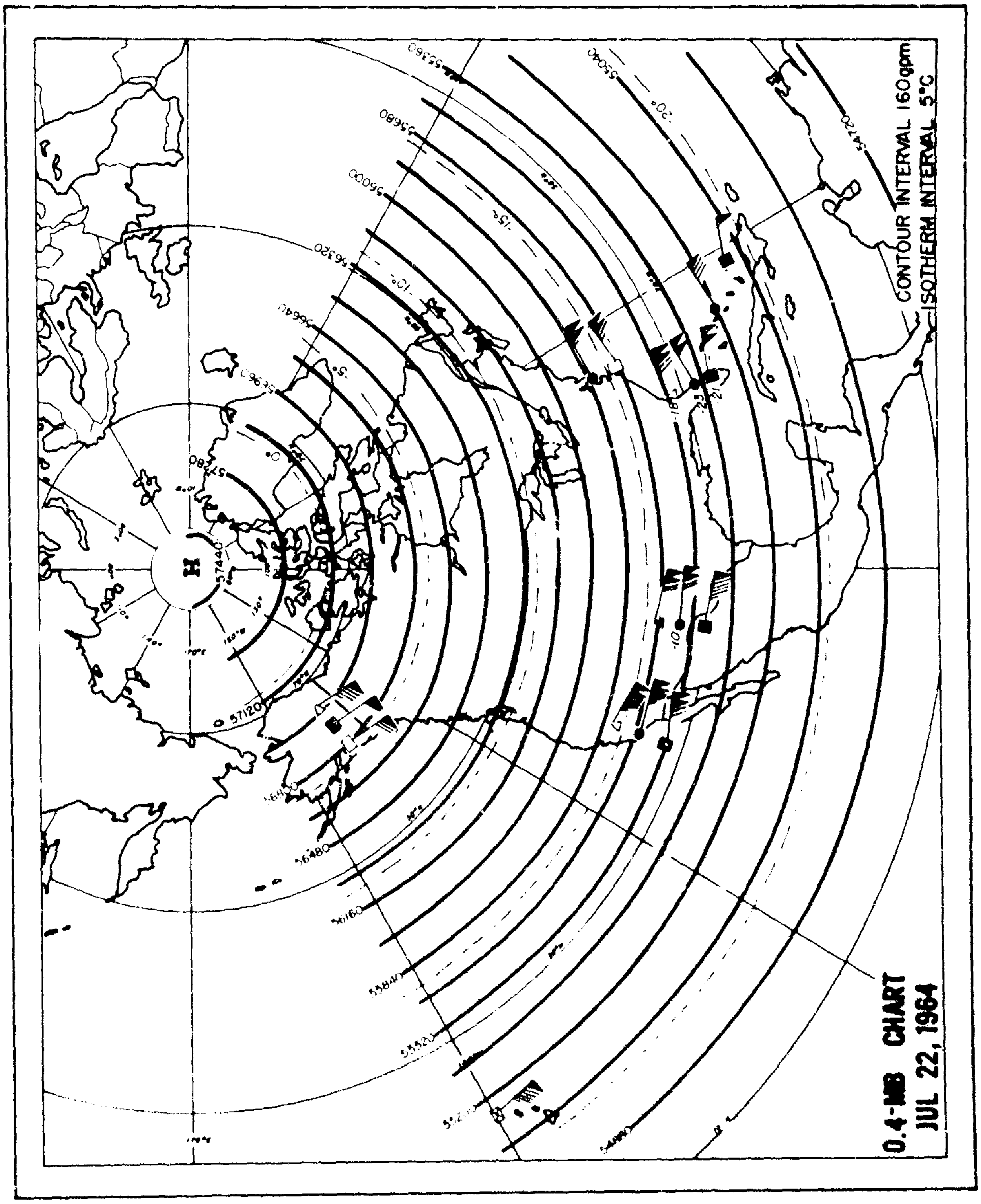
35920
36000
36160
36320


2-MB CHART
JUL 22, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
43360
43680
44000
44160
43840
43520
43200
43040
42720
42880
H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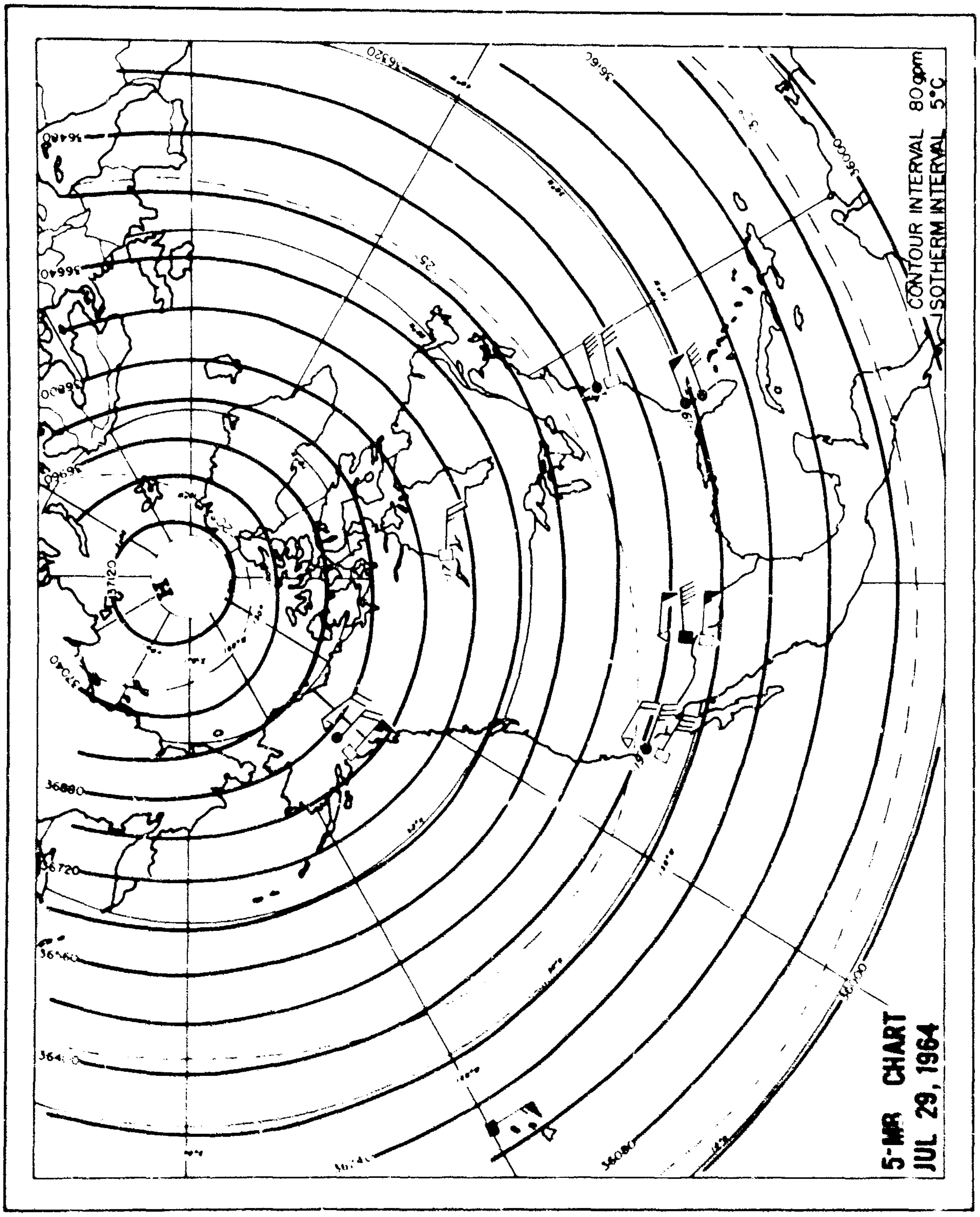
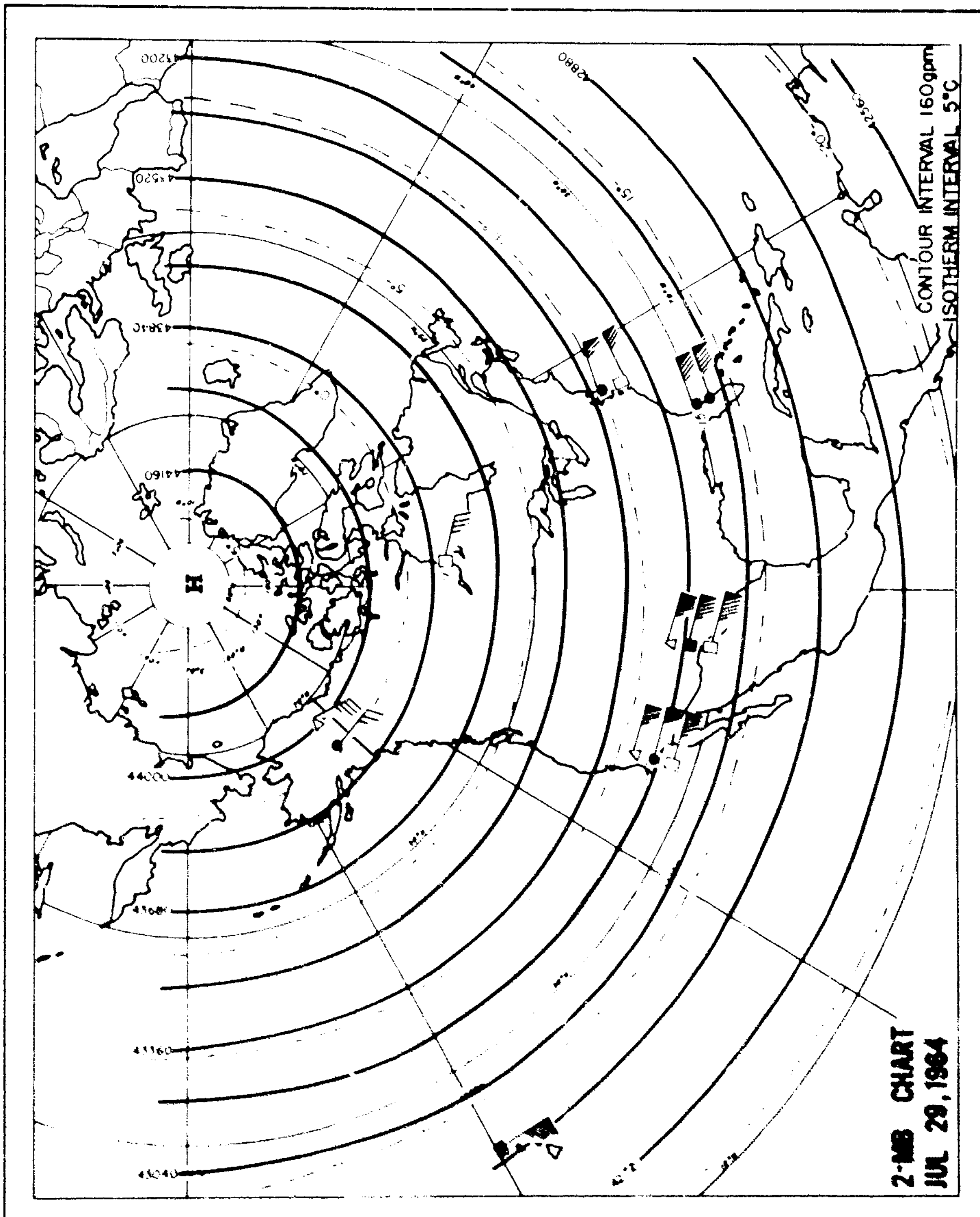
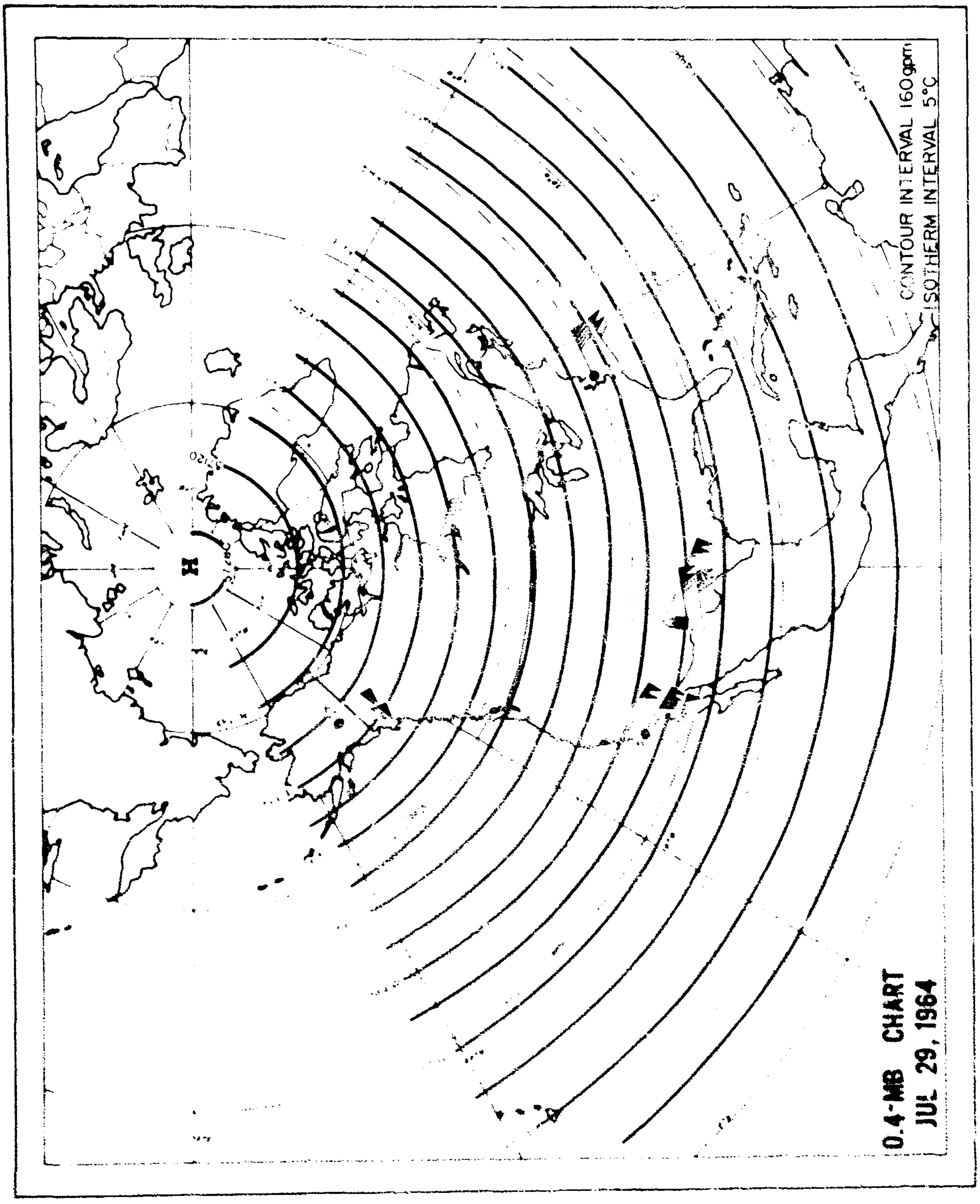
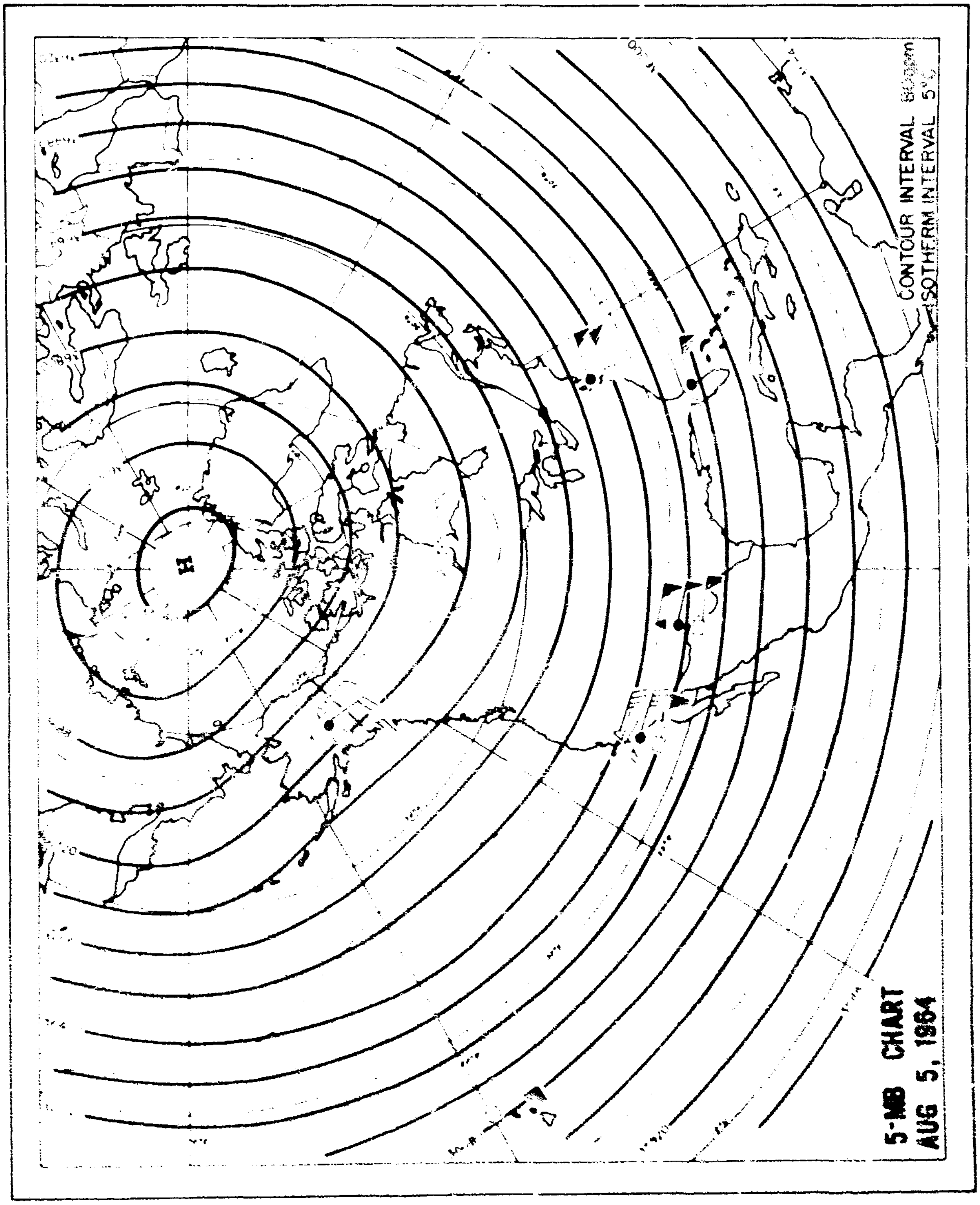
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C

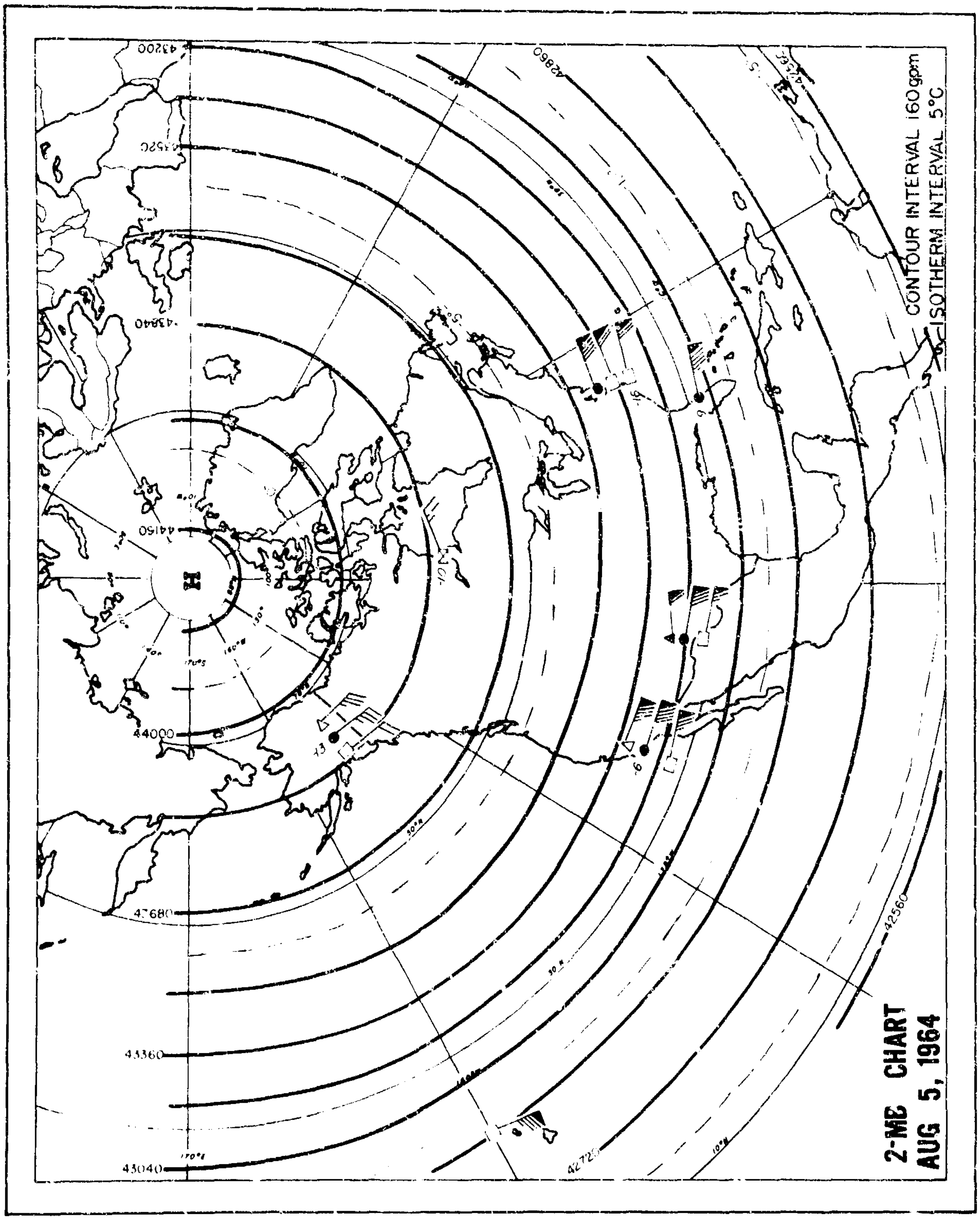

5-MR CHART
JUL 29, 1964
CONTOUR INTERVAL 80 gpm
ISOTHERM INTERVAL 5°C

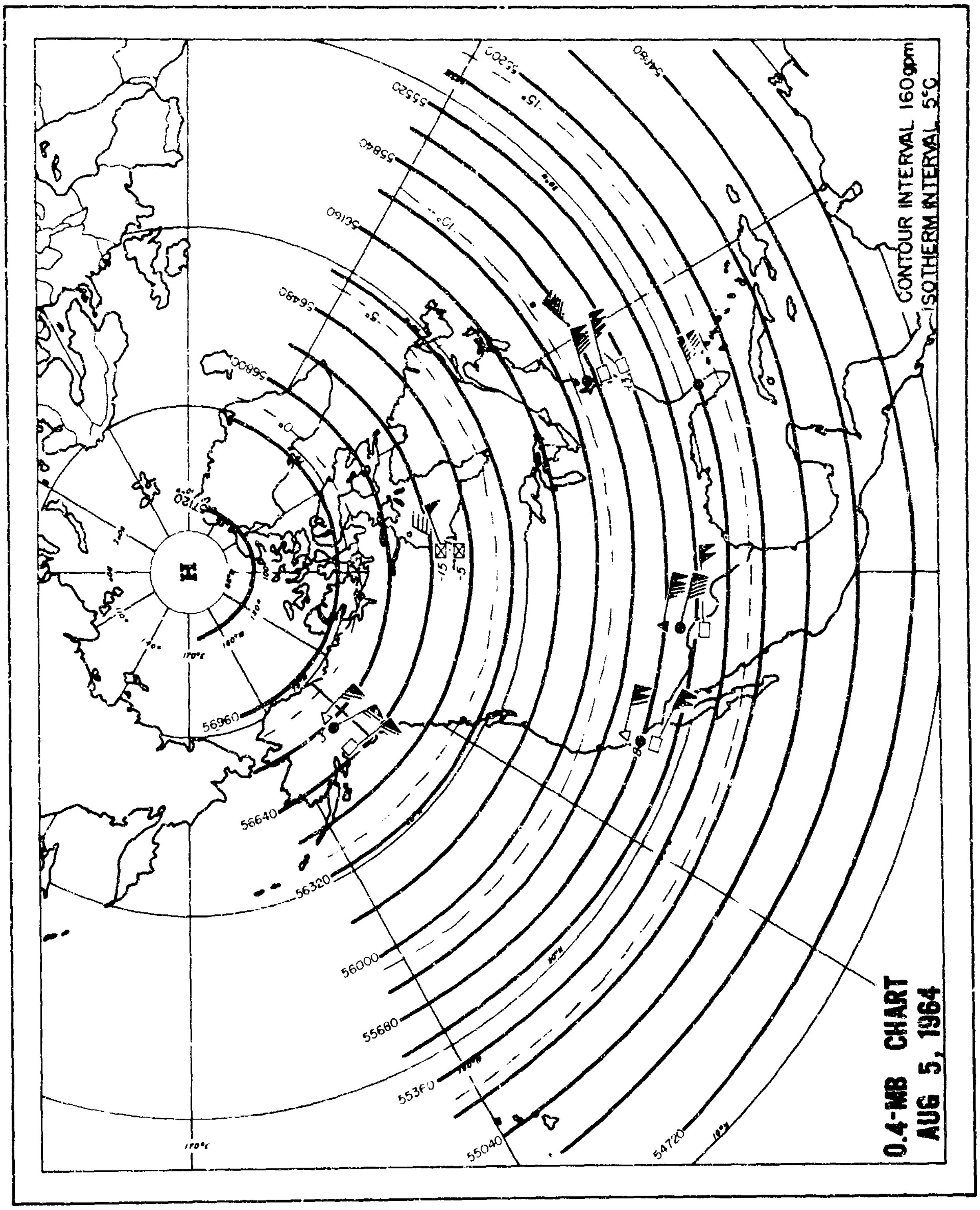

2-MB CHART
JUL 29, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
H


0.4-MB CHART
JUL 29, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C



5-MB CHART
AUG 5, 1964
CONTOUR INTERVAL
ISOTHERM INTERVAL


2-MB CHART
AUG 5, 1964
CONTOUR INTERVAL 160 gpm
ISOTHERM INTERVAL 5°C
43200
43520
43840
44160
44000
43360
43040
42560
42880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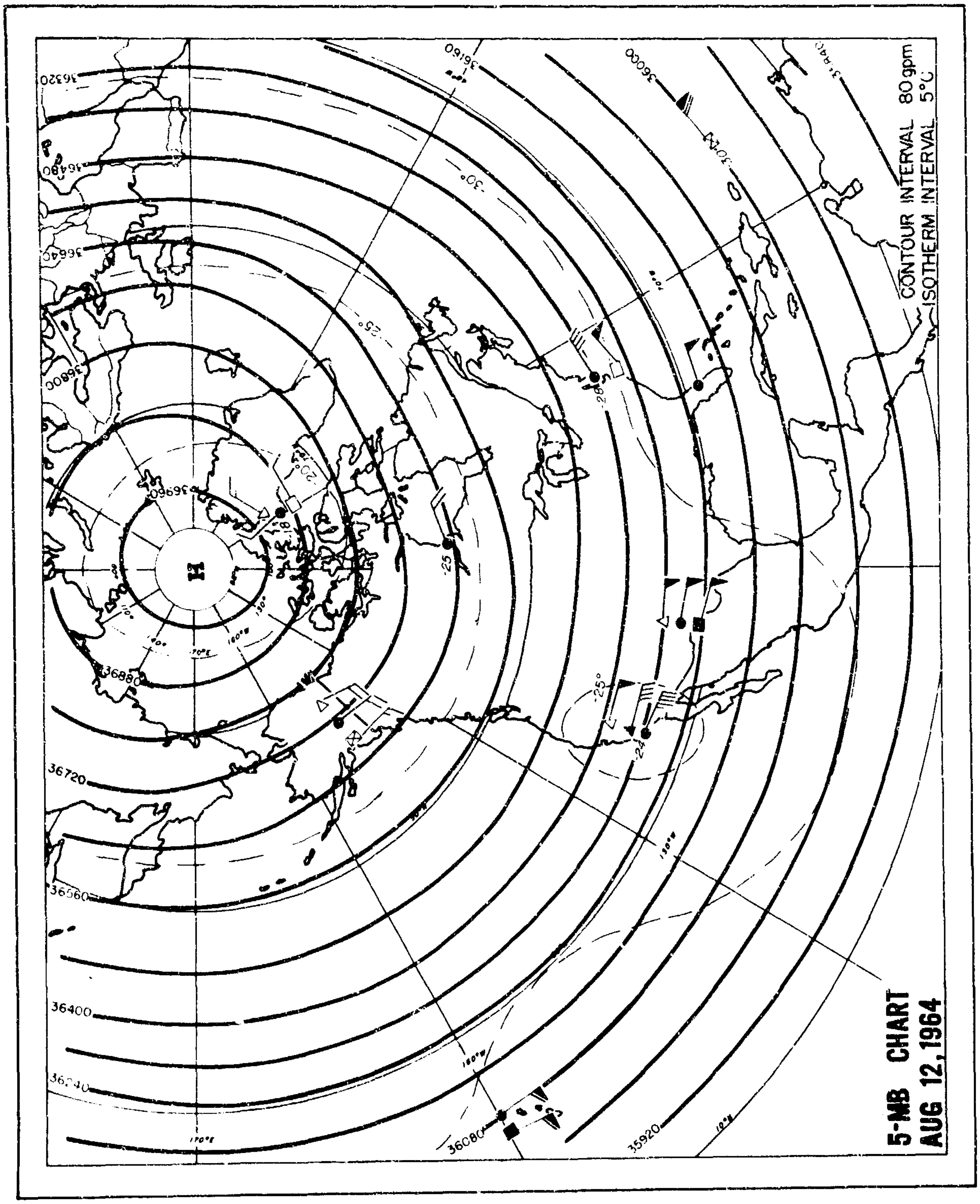
AUG 5, 1964
CONTOUR INTERVAL 160 gpm
ISOTHERM INTERVAL 5°C


5-MB CHART
AUG 12, 1964
CONTOUR INTERVAL 80 gpm
ISOTHERM INTERVAL 5°C
36320
36480
36640
36800
36960
36880
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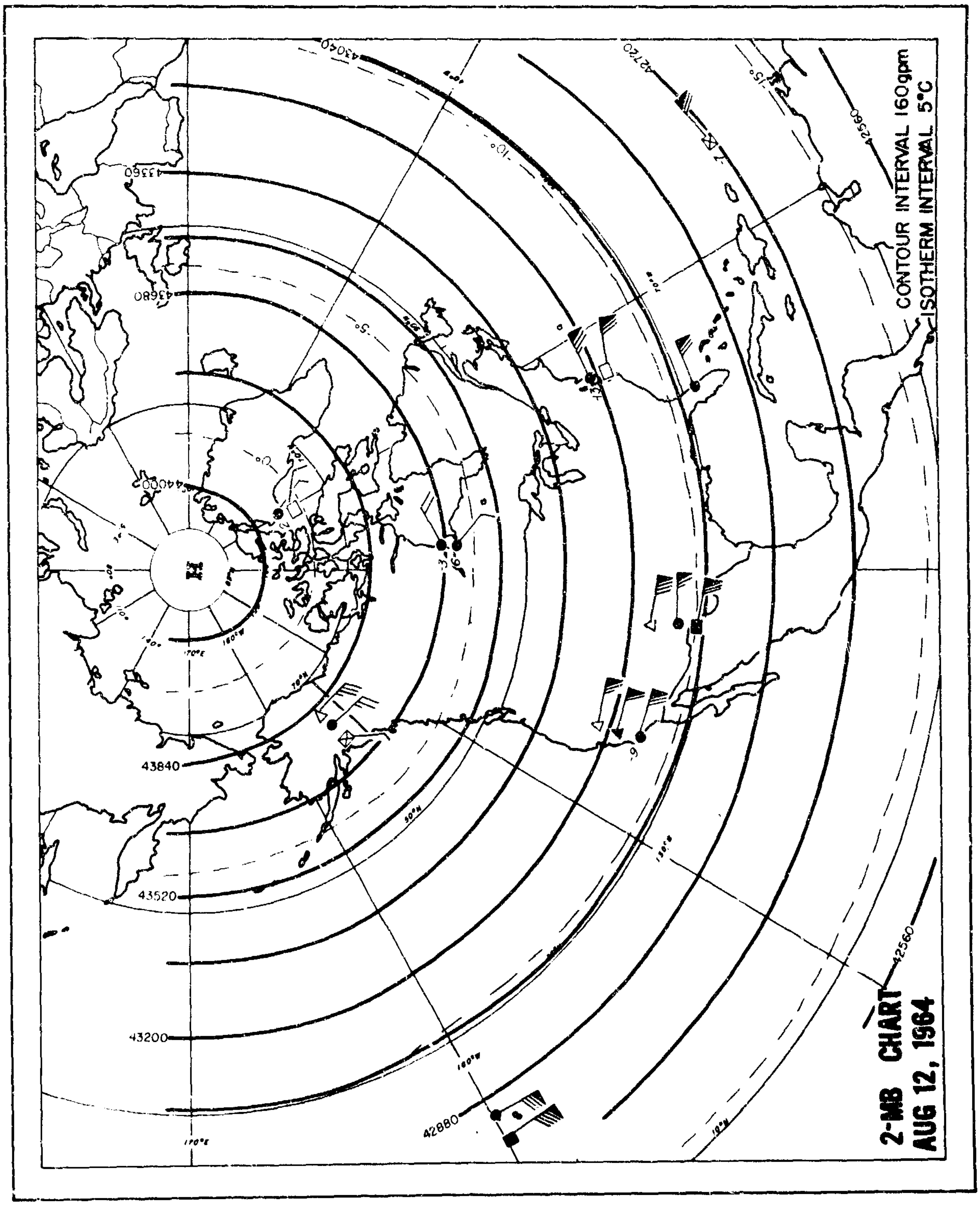
36080
35920
36000
36160


2-MB CHART
AUG 12, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
44000
43840
43680
43520
43360
43200
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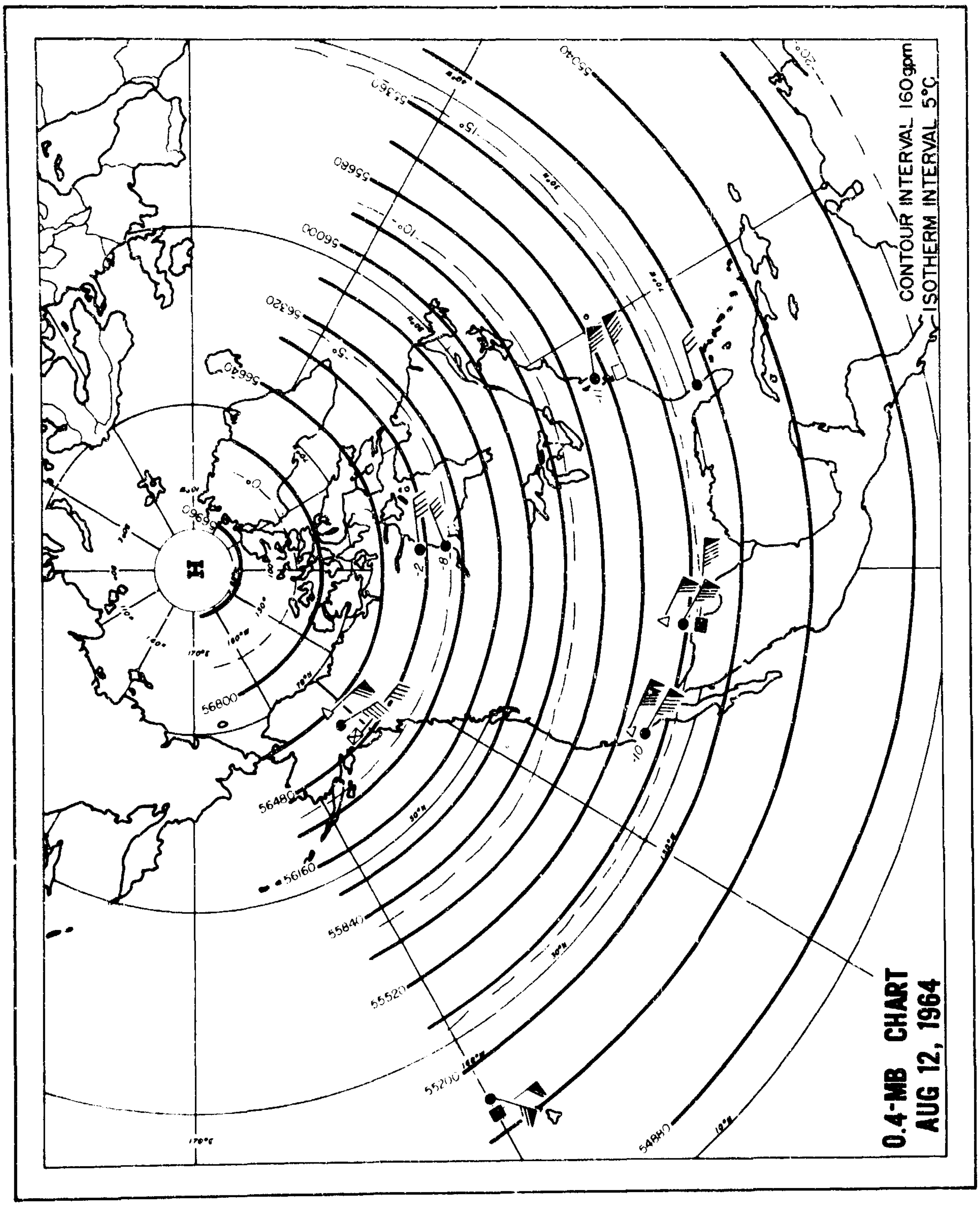
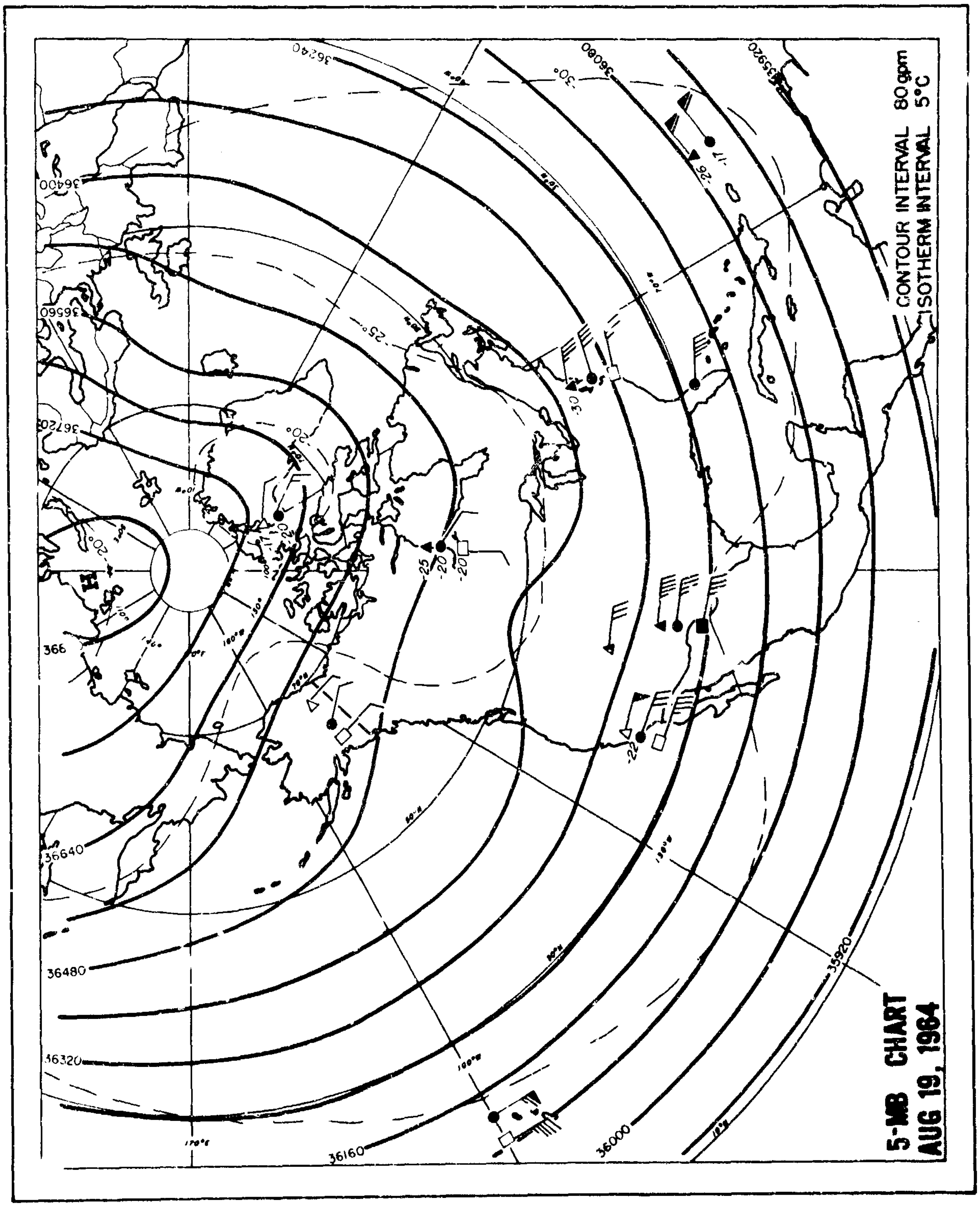
42880
42720
42560
H


0.4-MB CHART
AUG 12, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
56960
56800
56640
56480
56320
56160
56000
55840
55680
55520
55360
55200
55040
54880


5-MB CHART
AUG 19, 1964
CONTOUR INTERVAL 80 gpm
ISOTHERM INTERVAL 5°C
36640
36480
36320
36160
36000
35920
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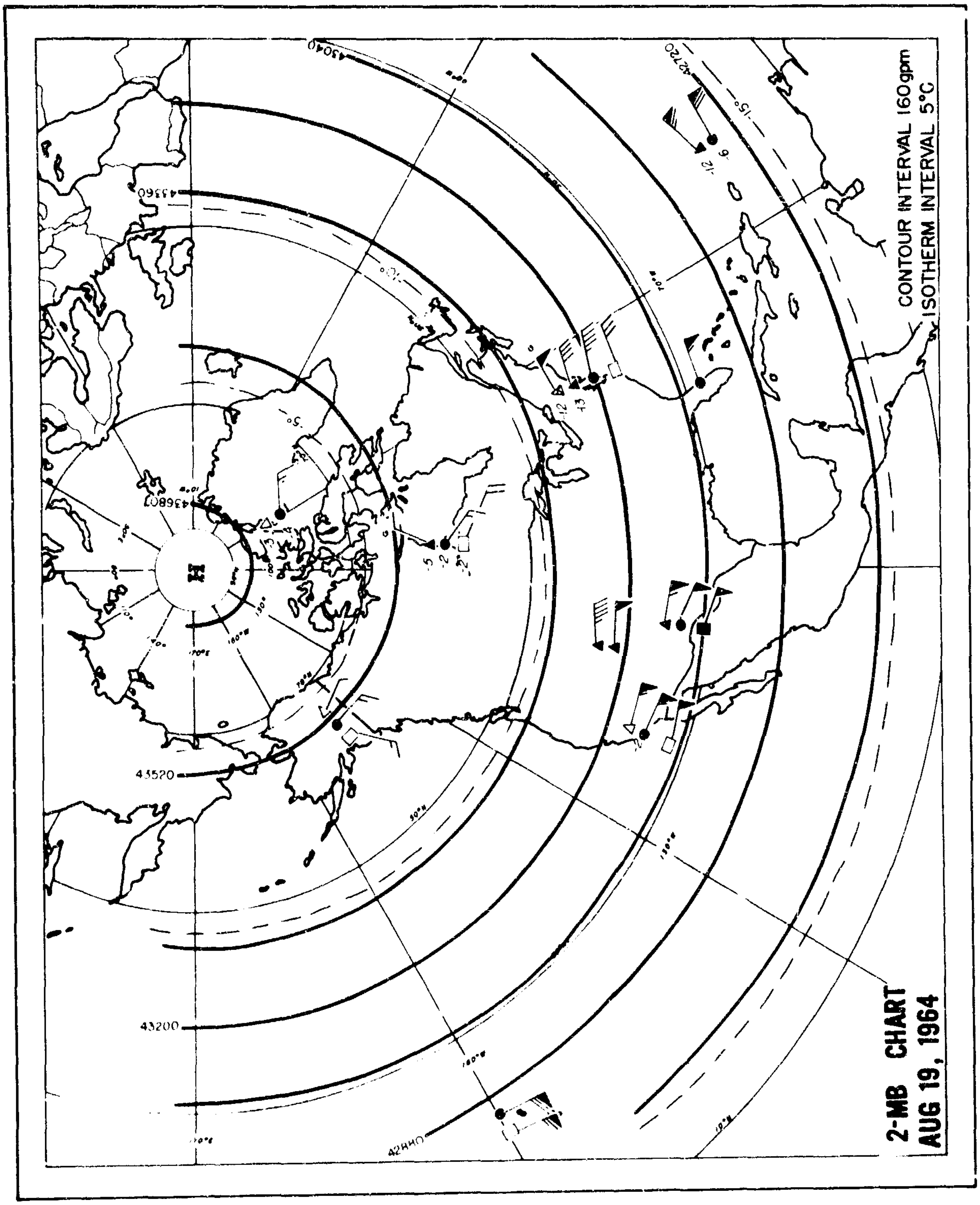
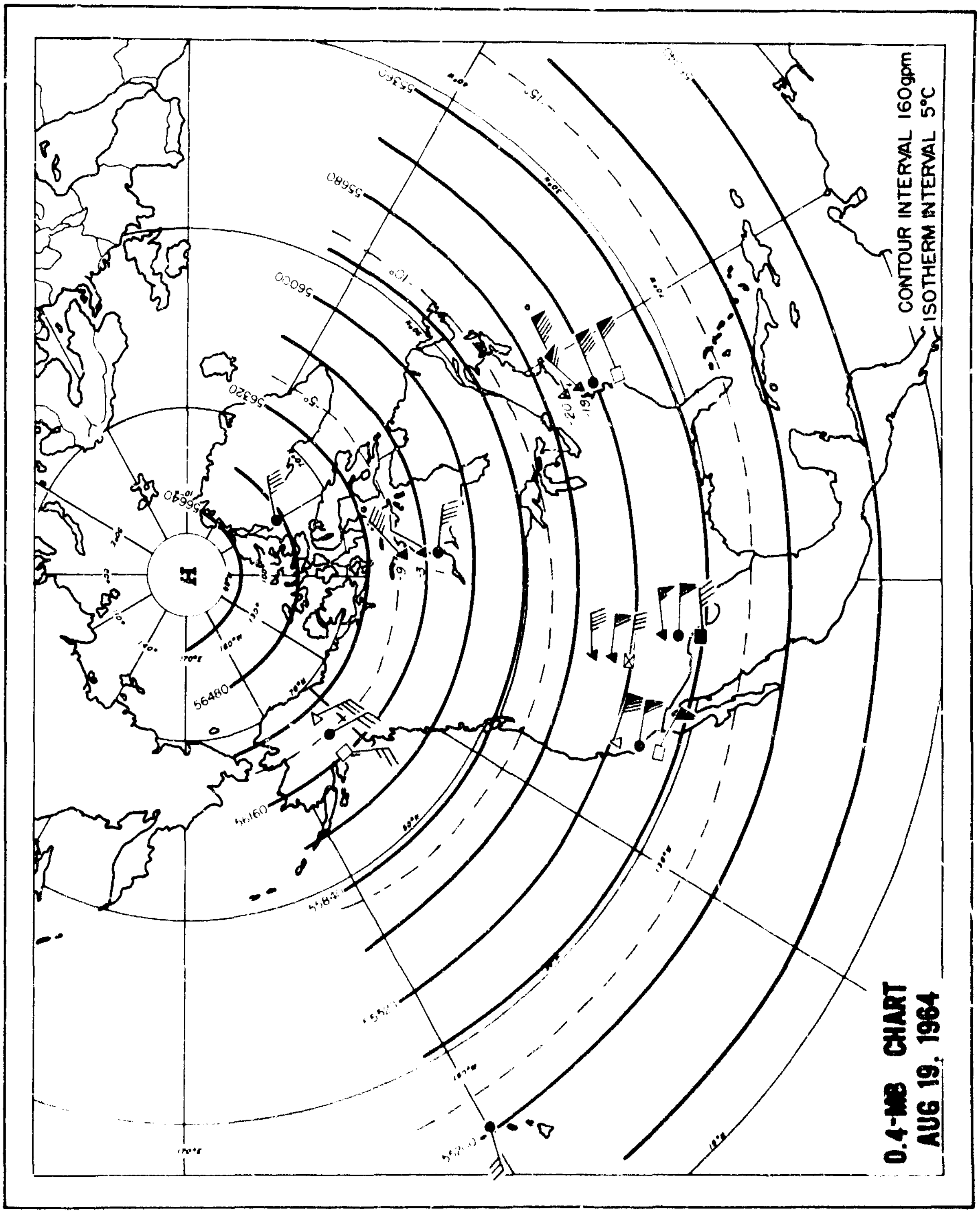
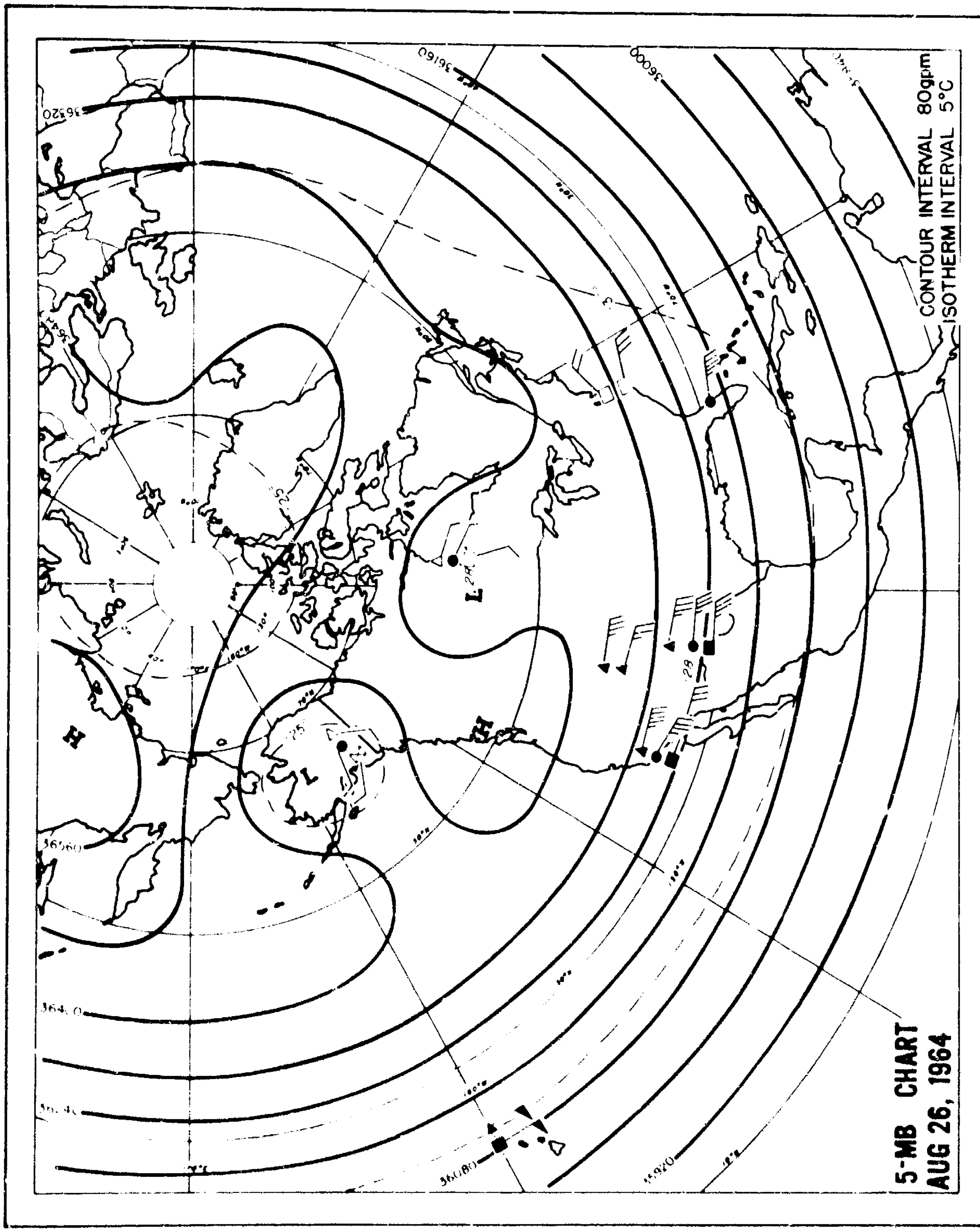
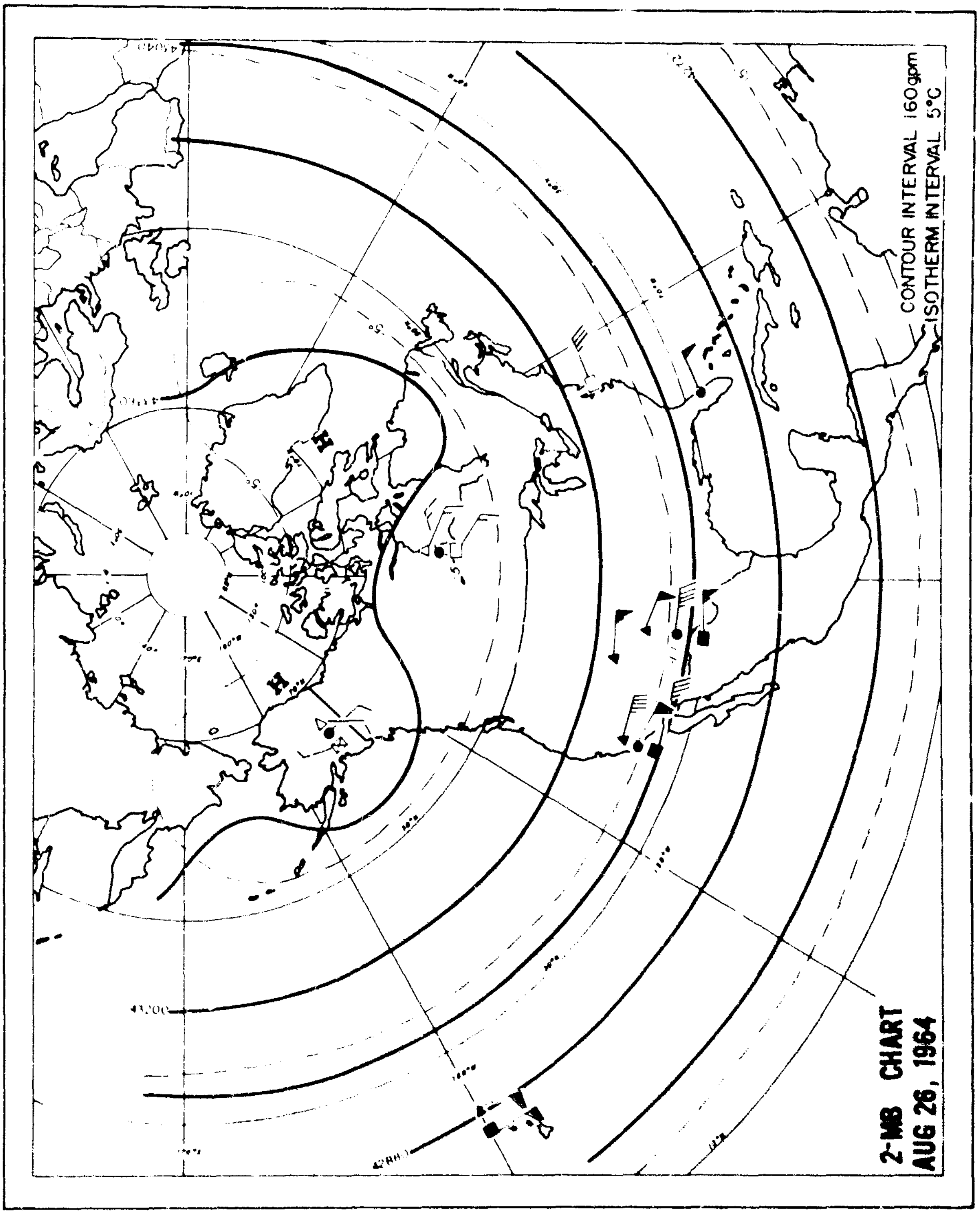
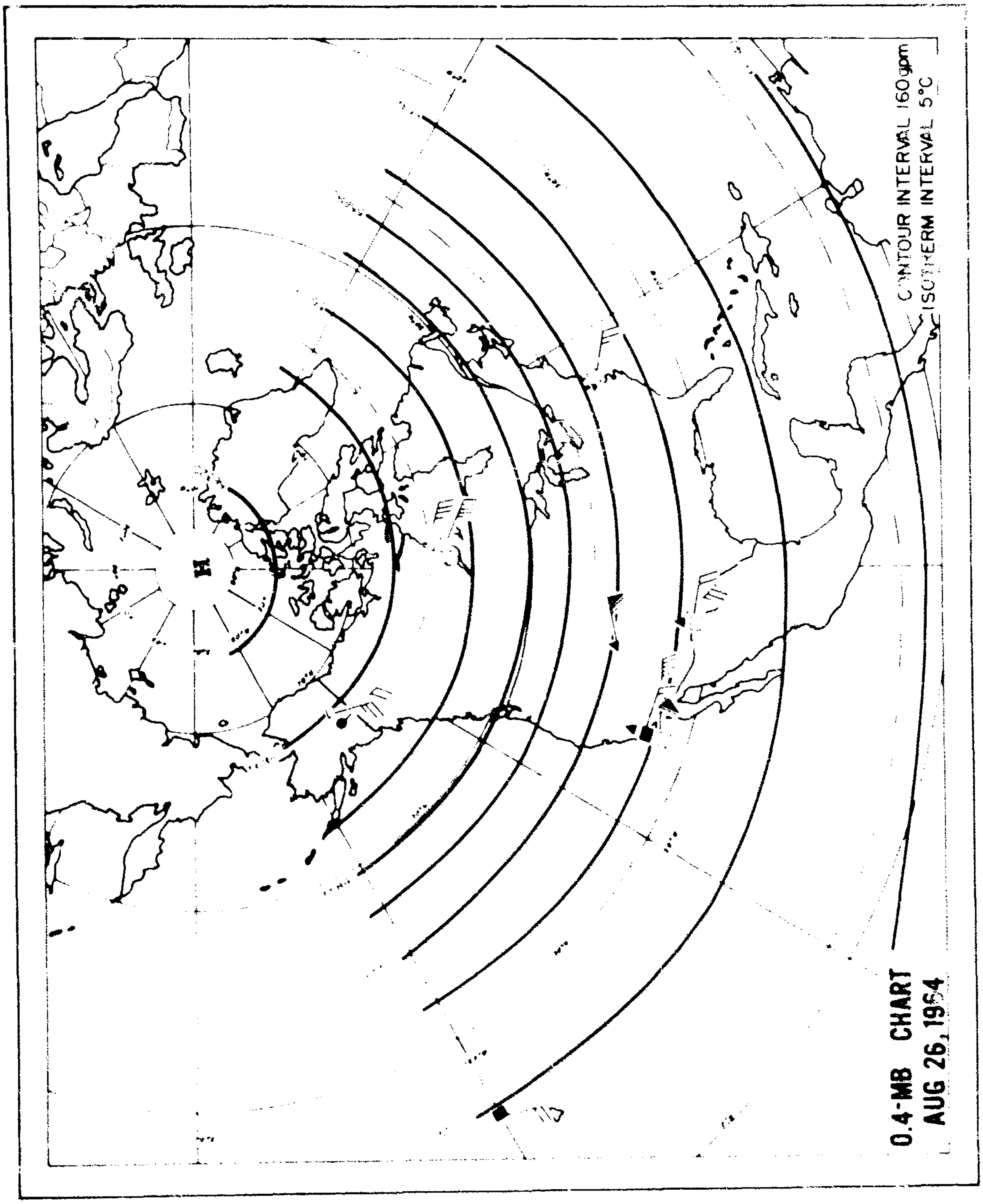
36560
36720
36240
36080


2-MB CHART
AUG 19, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
43040
43360
43680
43520
43200
42880
42720

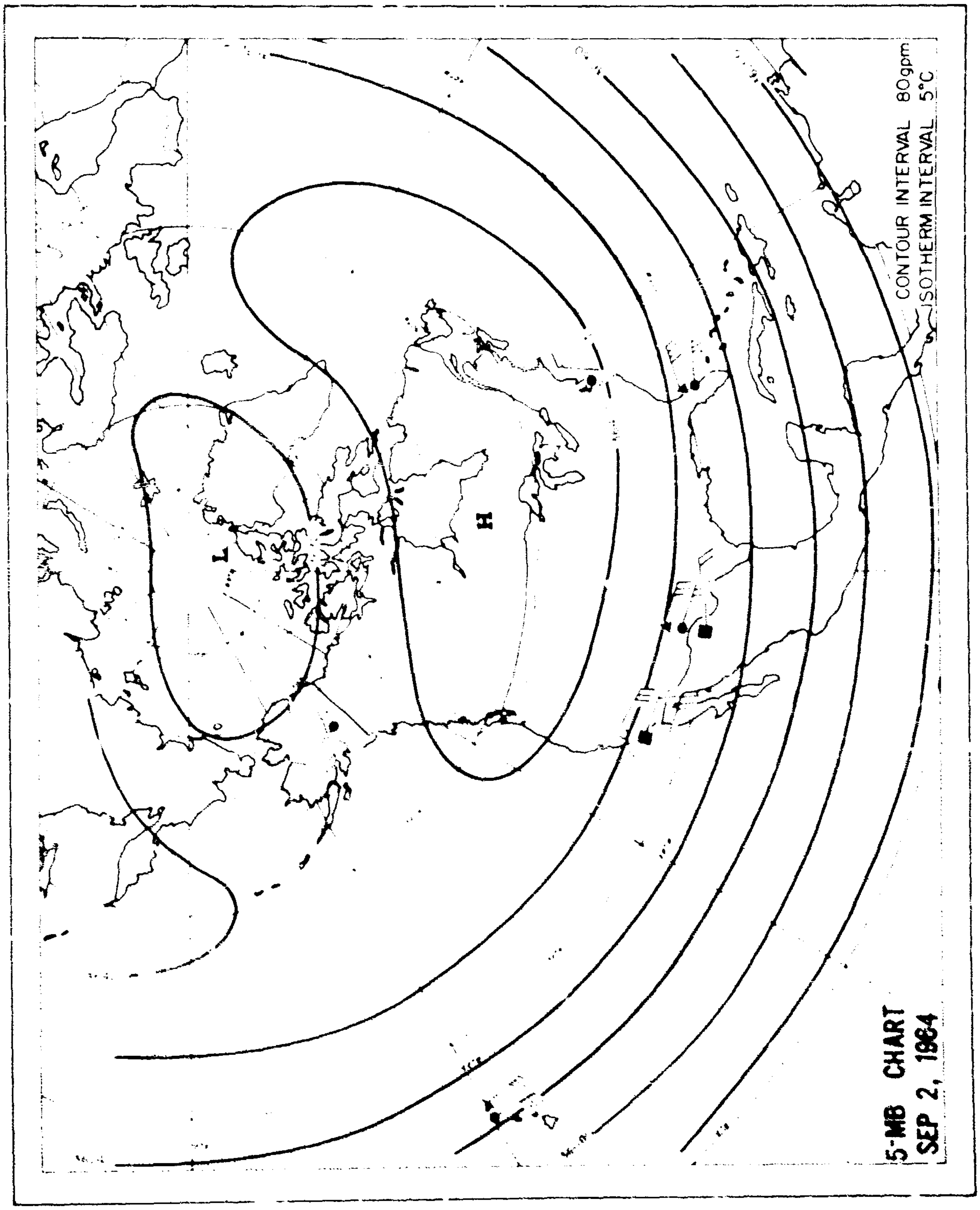

0.4-MB CHART
AUG 19, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
H
56480
56640
56320
56000
55680
55360
56160


5-MB CHART
AUG 26, 1964
CONTOUR INTERVAL 80gpm
ISOTHERM INTERVAL 5°C
36000
36160
36520

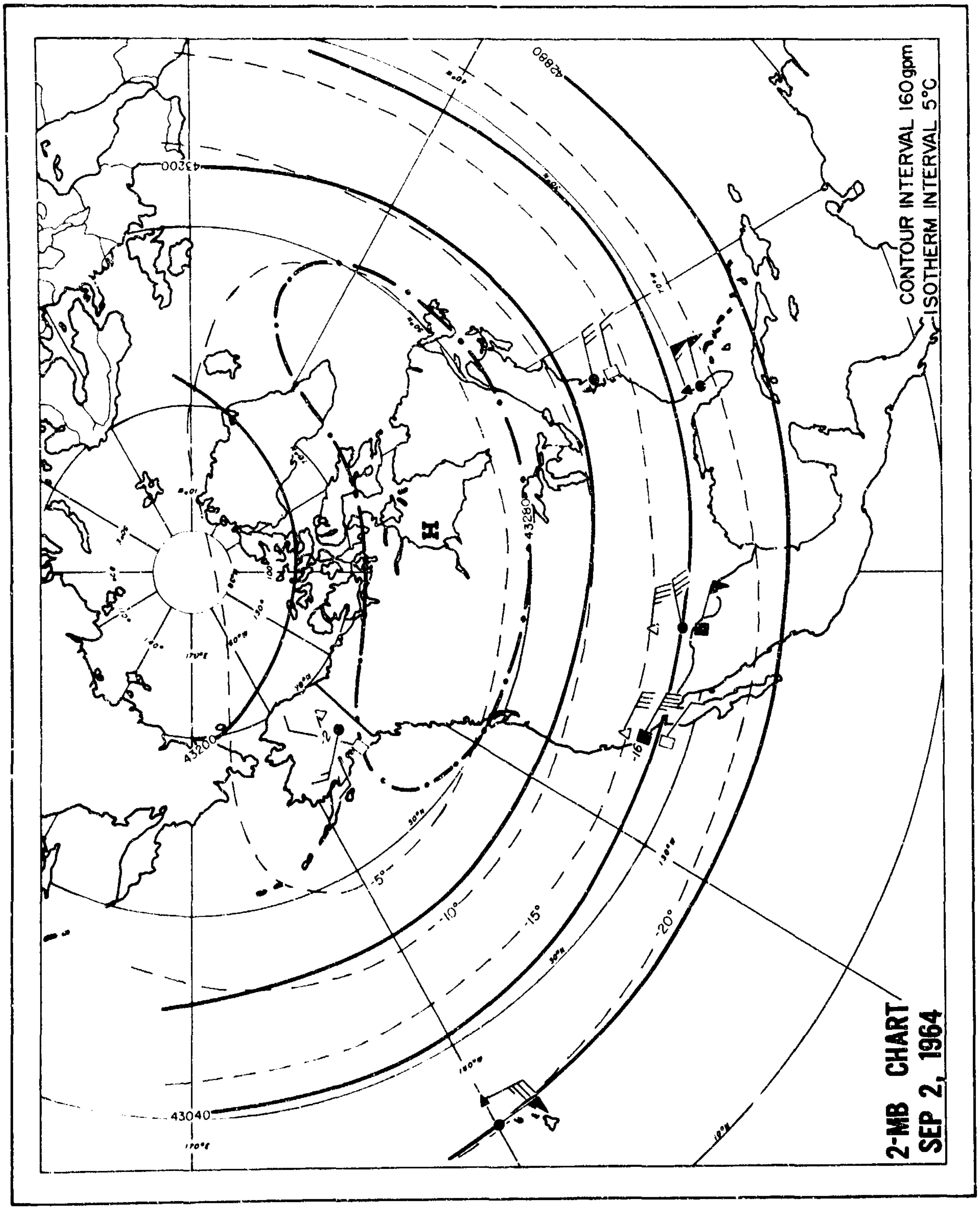

2-MB CHART
AUG 26, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C

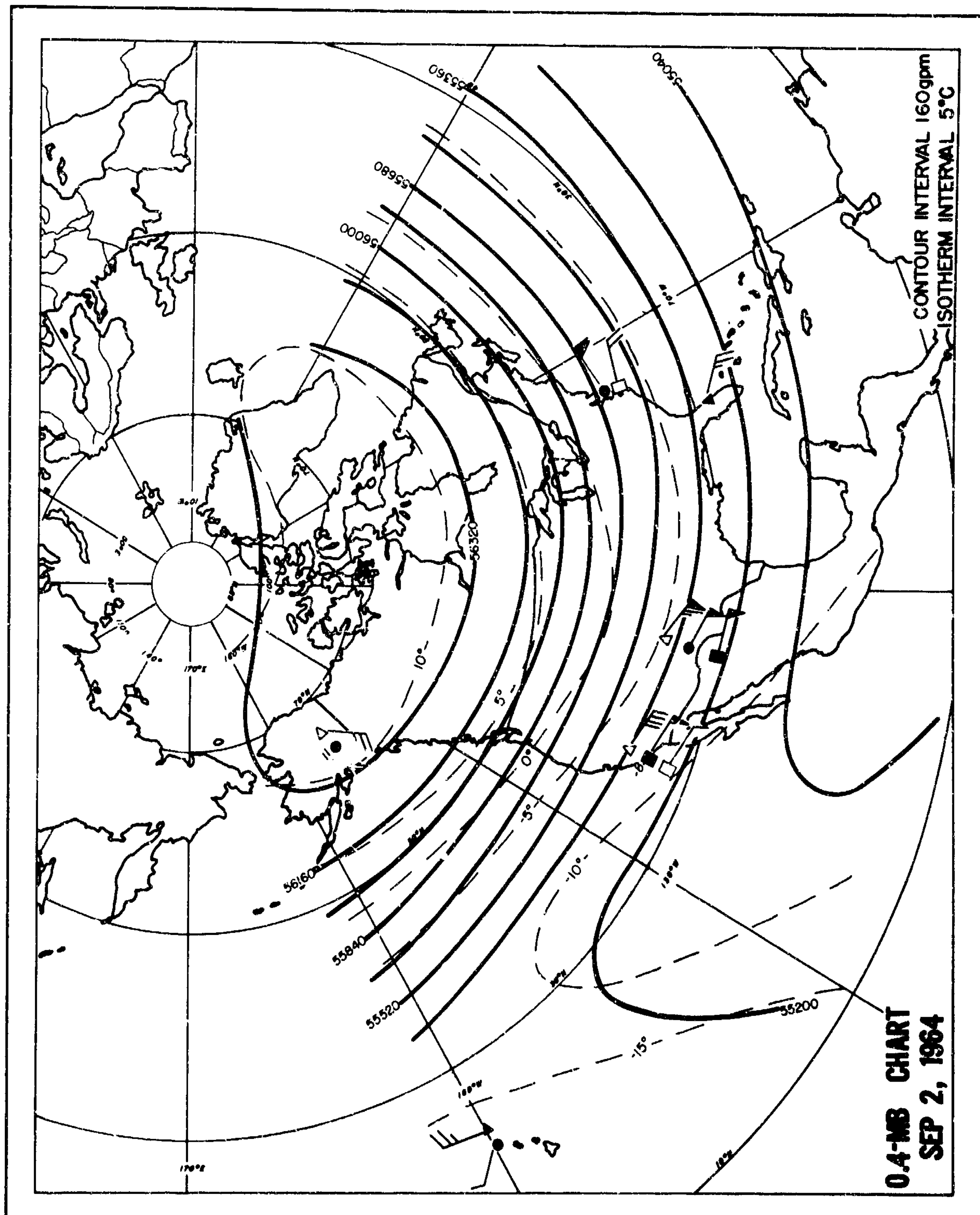


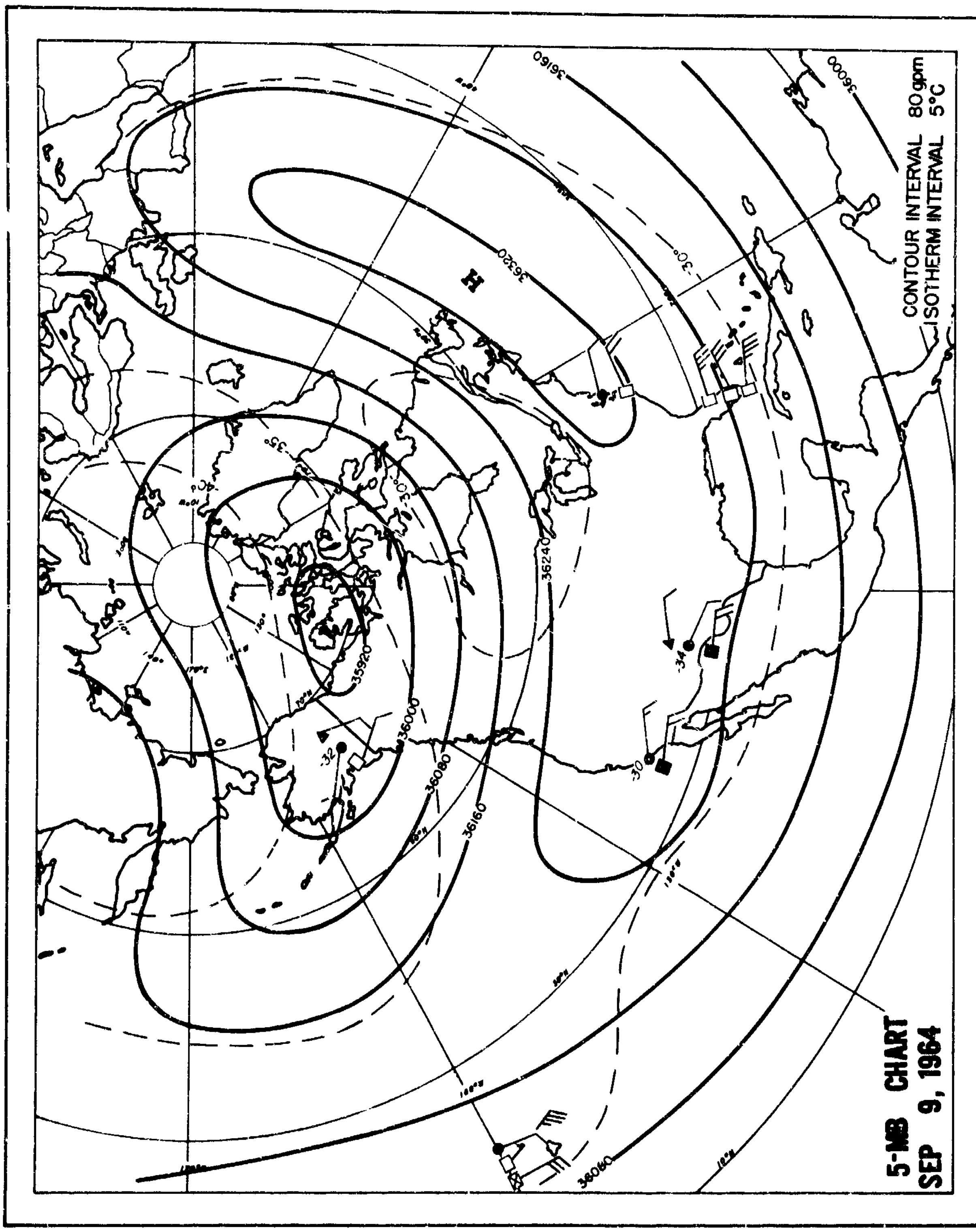
0.4-MB CHART
AUG 26, 1964
CONTOUR INTERVAL 160 gpm
ISOTHERM INTERVAL 5°C

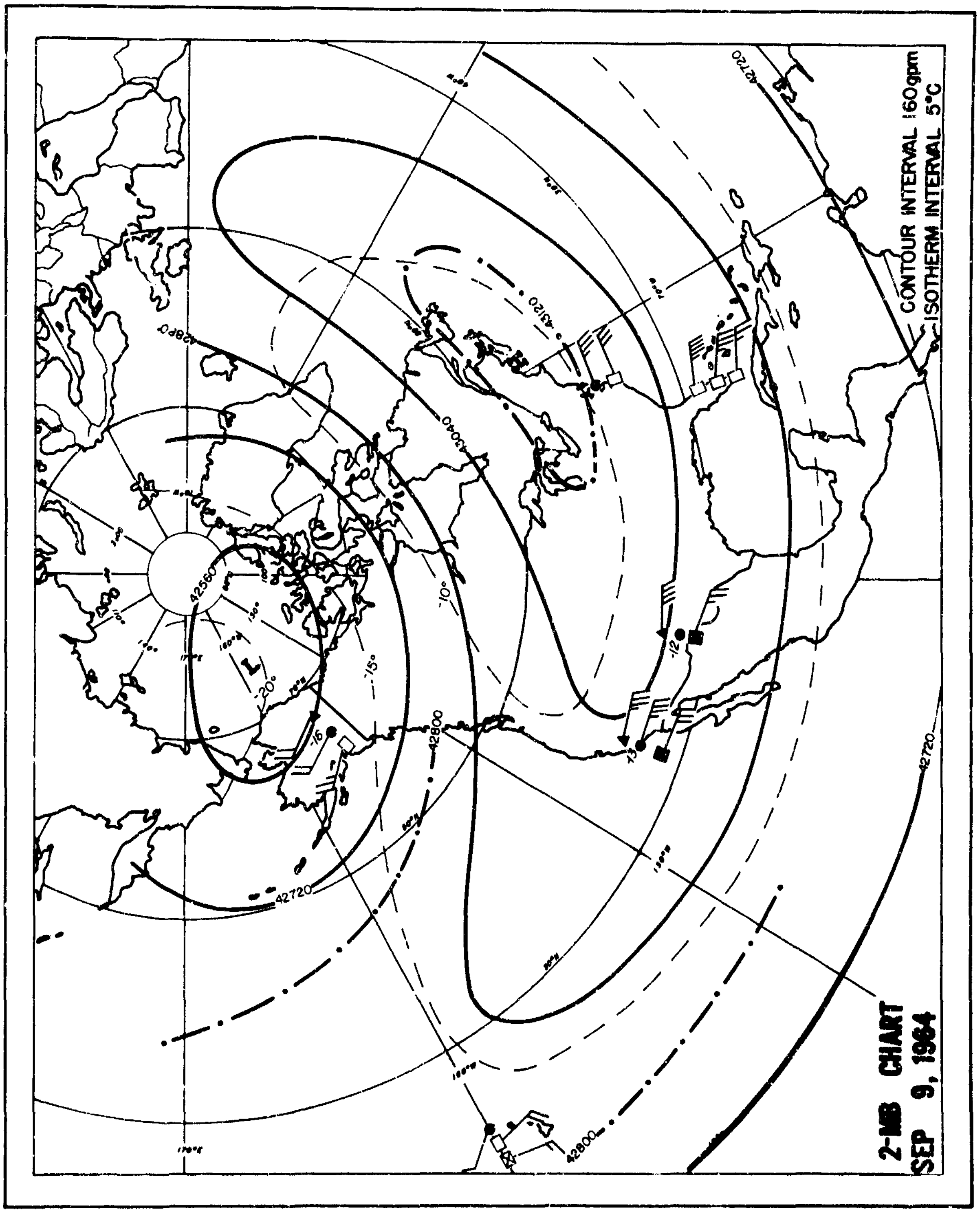


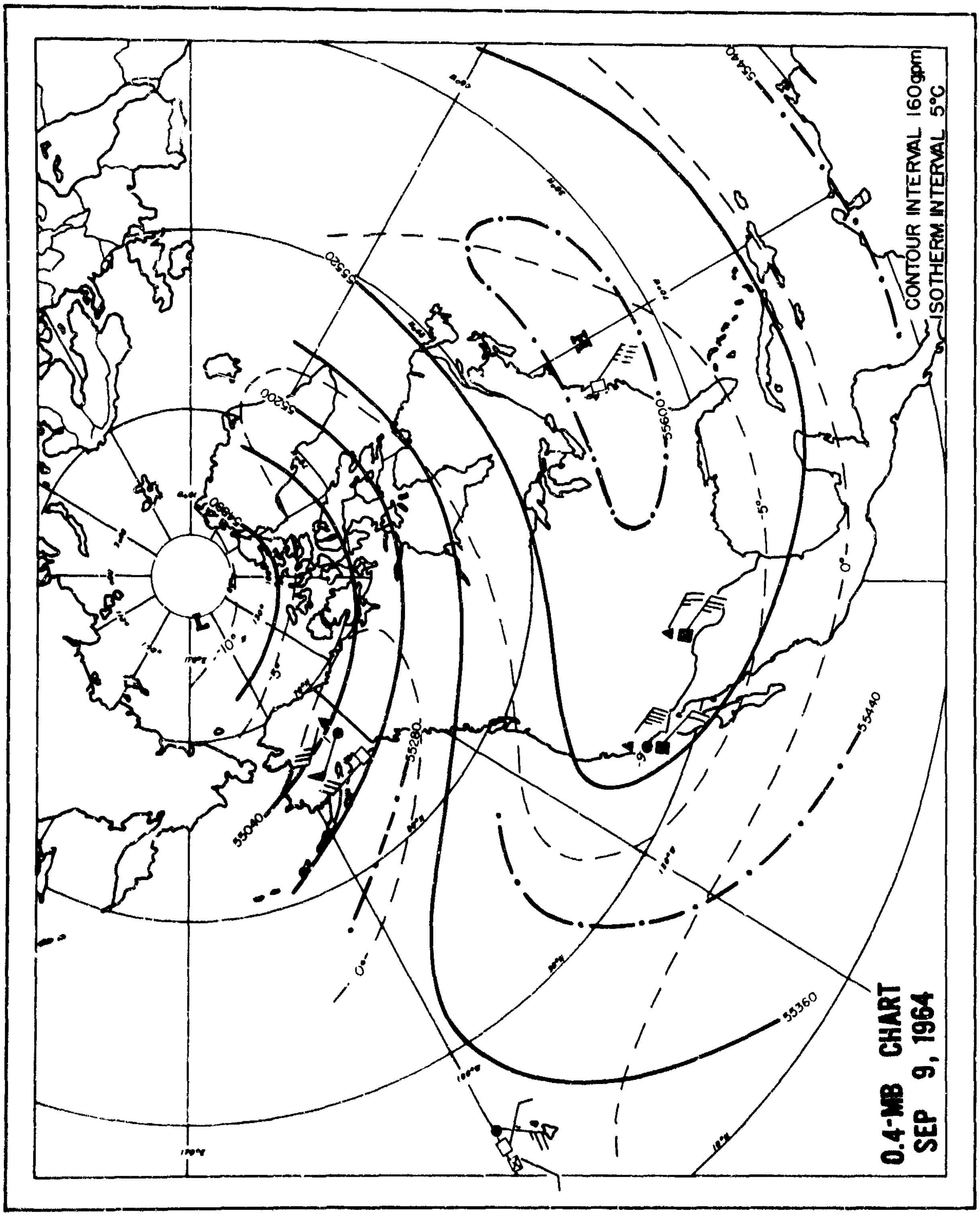
5-MB CHART
SEP 2, 1964
CONTOUR INTERVAL 80gpm
ISOTHERM INTERVAL 5°C
H
L


2-MB CHART
SEP 2, 1964
CONTOUR INTERVAL 160 gpm
ISOTHERM INTERVAL 5°C
43200
42880
43280
43040
-5°
-10°
-15°
-20°

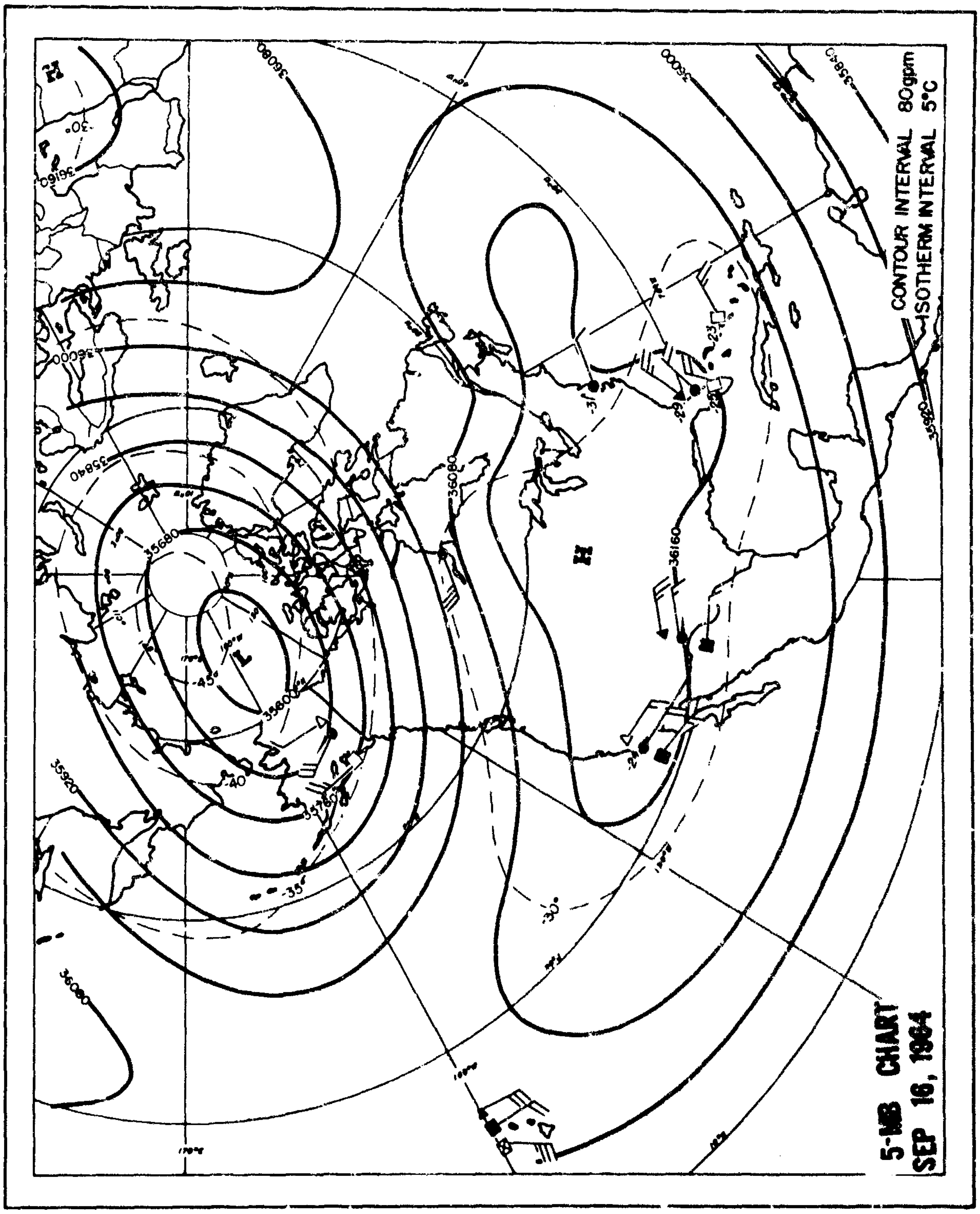

0.4-MB CHART
SEP 2, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
55040
55360
55680
56000
56320
56160
55840
55520
55200
10°
5°
0°
-5°
-10°
-15°

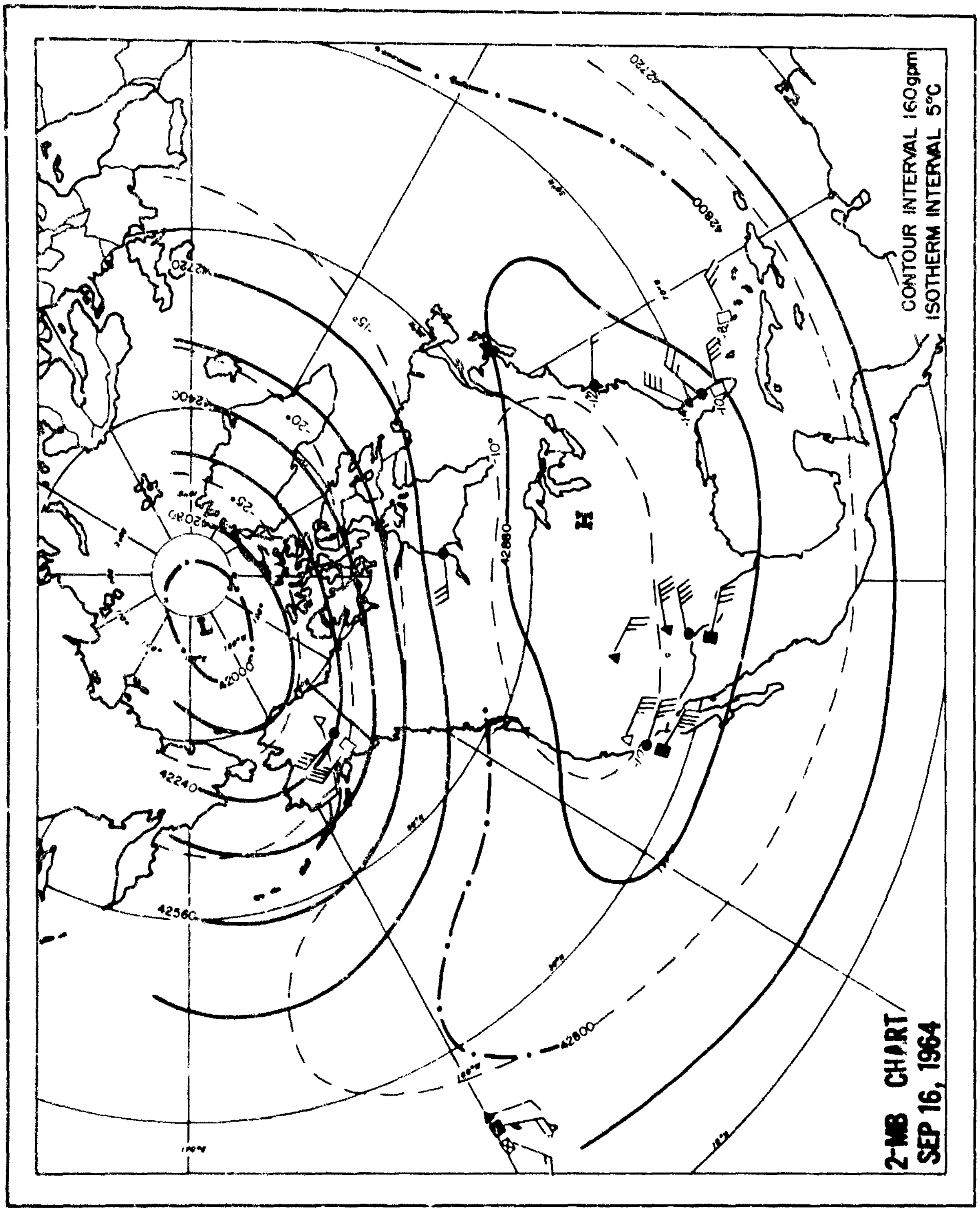

5-MB CHART
SEP 9, 1964
CONTOUR INTERVAL 80 gpm
ISOTHERM INTERVAL 5°C


2-MB CHART
SEP 9, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
42720
42800
43040
43120
42560
-10°
-15°
-20°

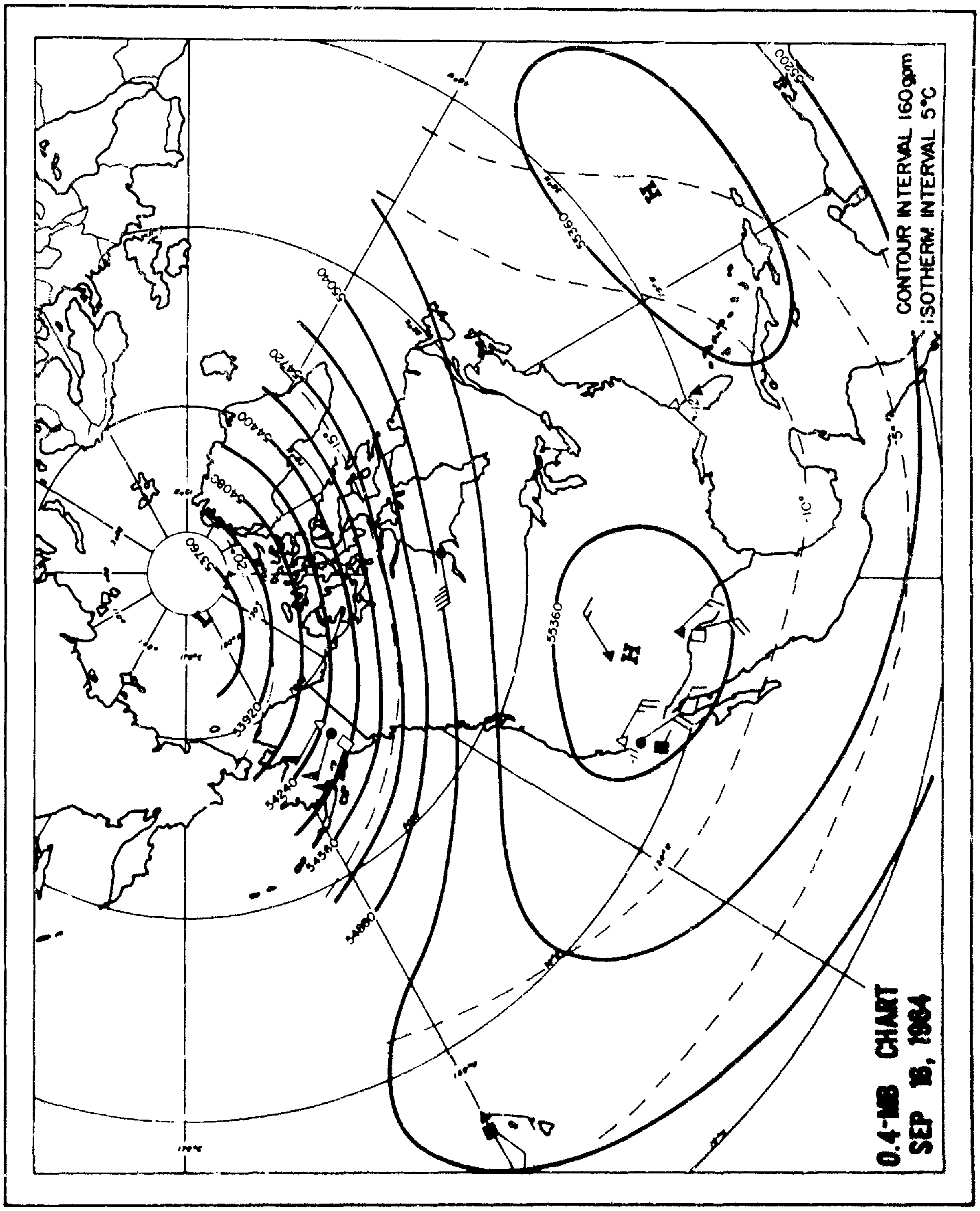


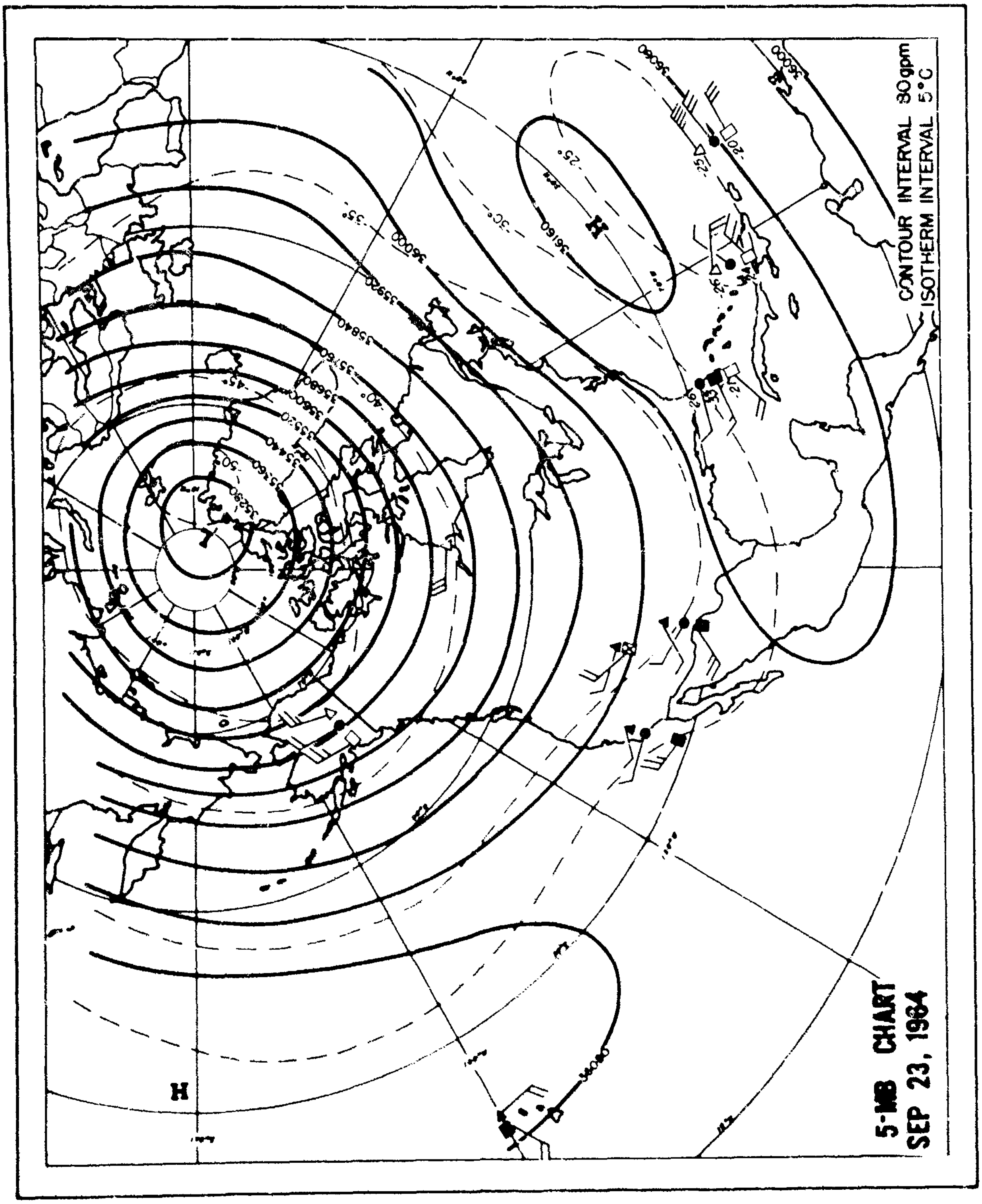
0.4-MB CHART
SEP 9, 1964

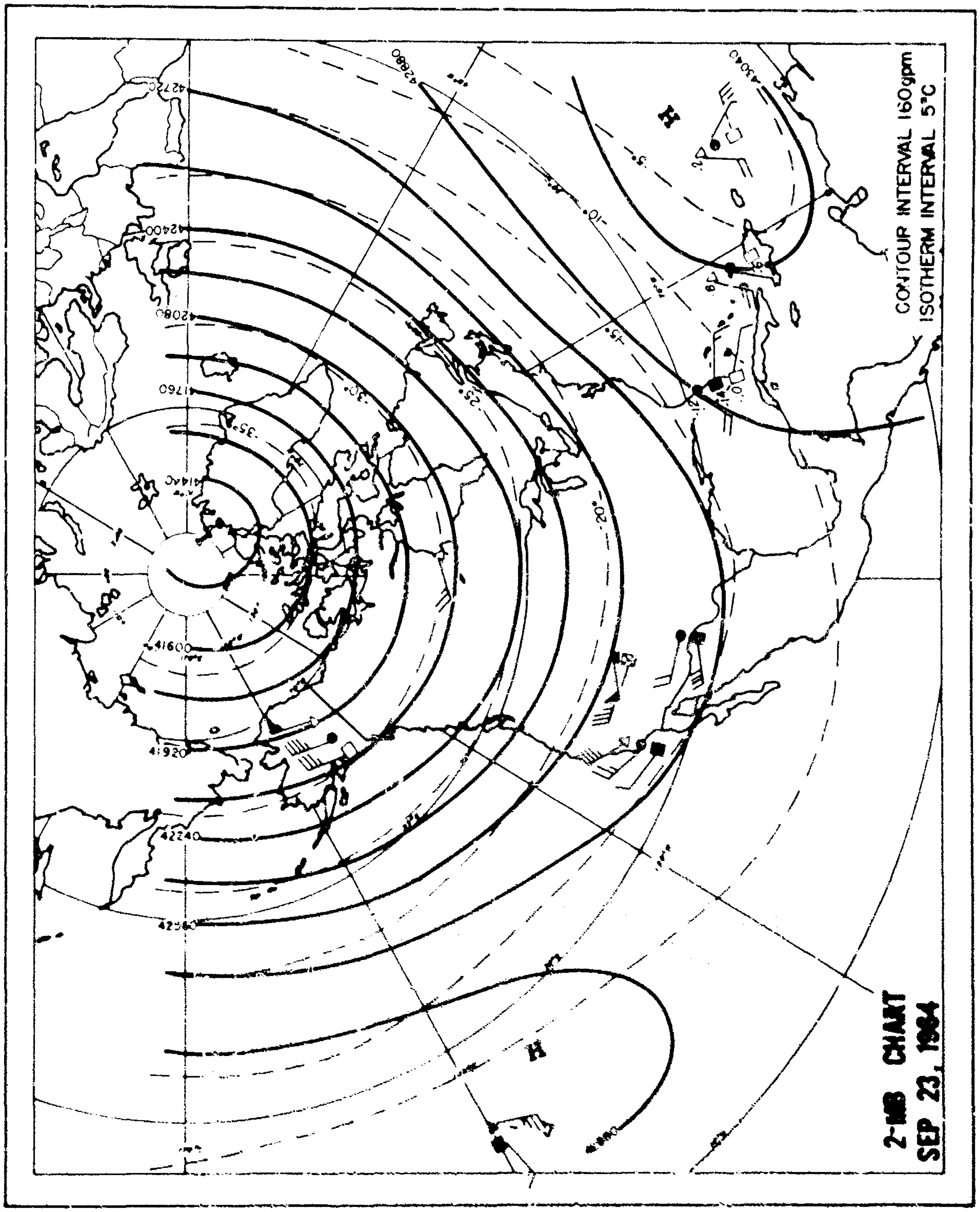

5-MB CHART
SEP 16, 1964
CONTOUR INTERVAL 80gpm
ISOTHERM INTERVAL 5°C

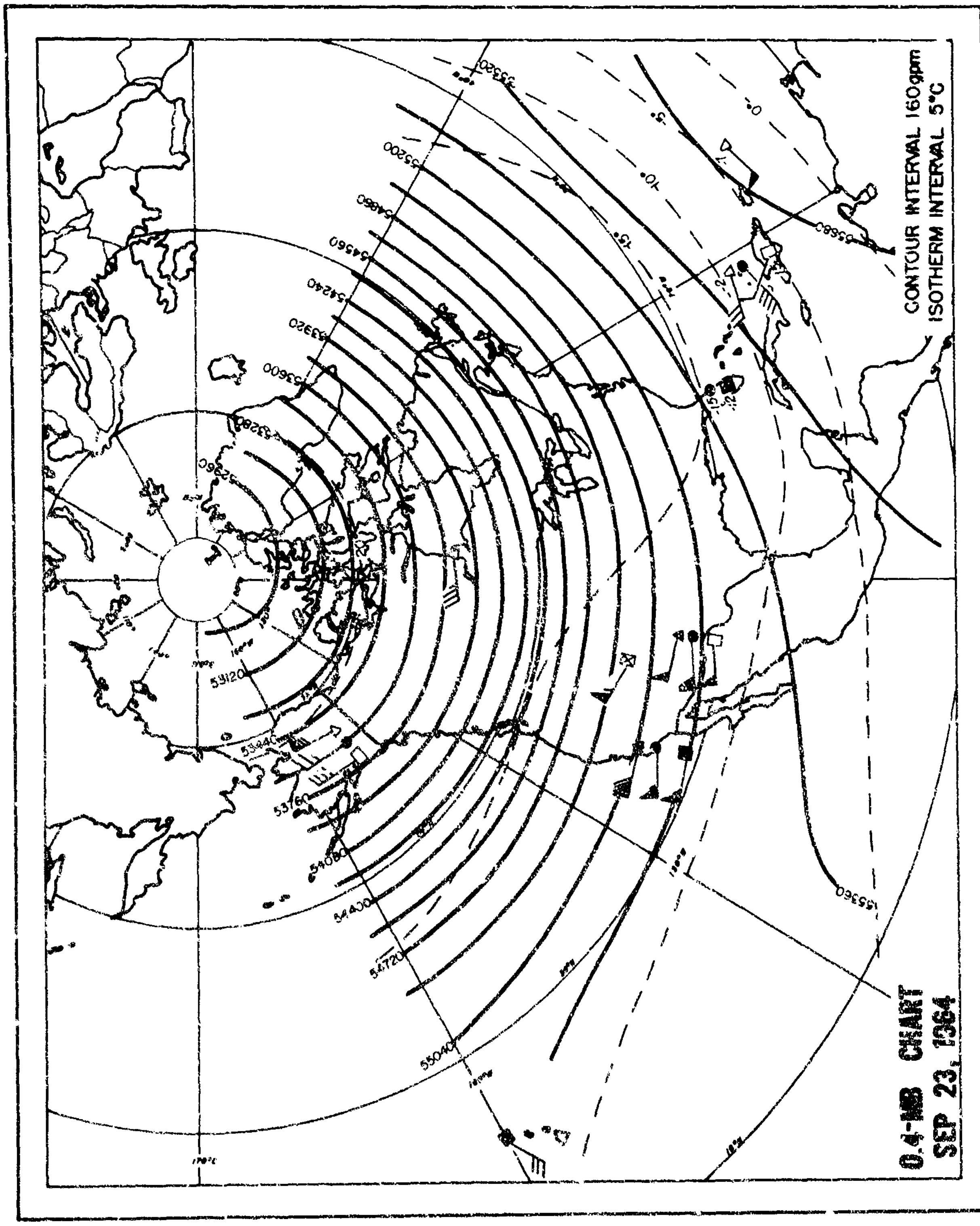


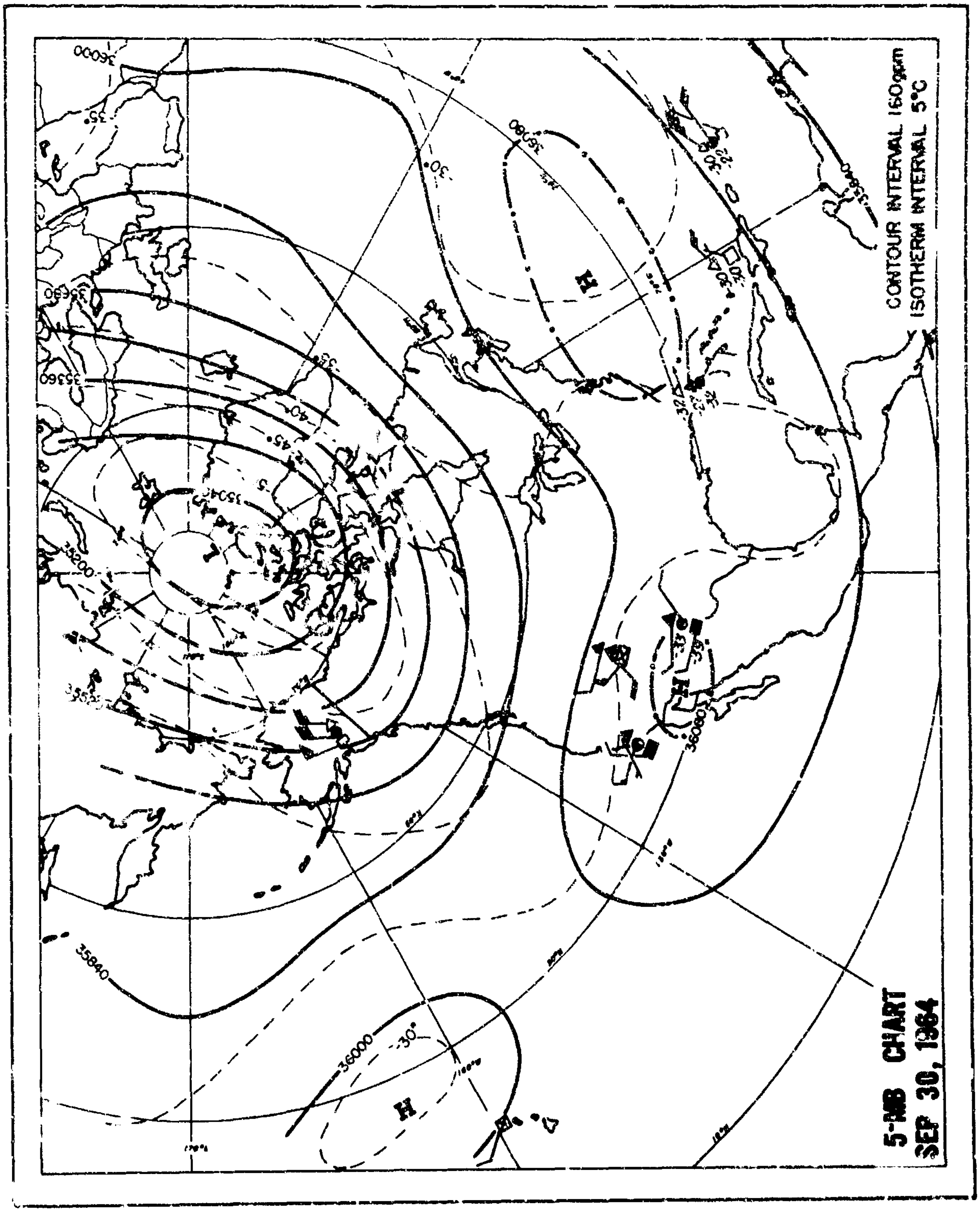
2-MB CHART
SEP 16, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
42240
42560
42800
42880
-10°
-15°
-20°
-25°

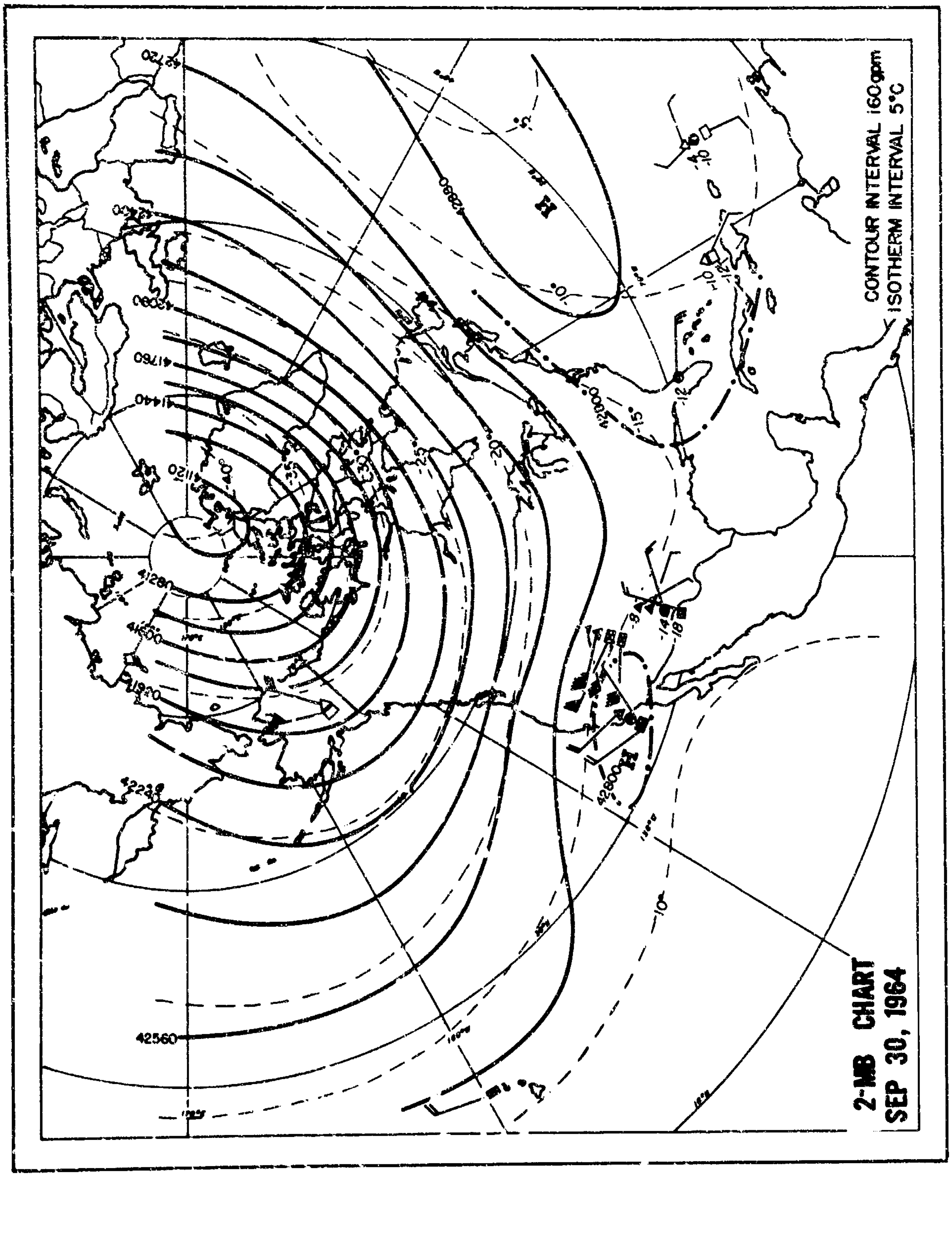

0.4-MB CHART
SEP 16, 1964
CONTOUR INTERVAL 160 gpm
ISOTHERM INTERVAL 5°C
53760
53920
54080
54240
54400
54720
55040
55360
55200
54880
H
H
-15°
-10°
-5°

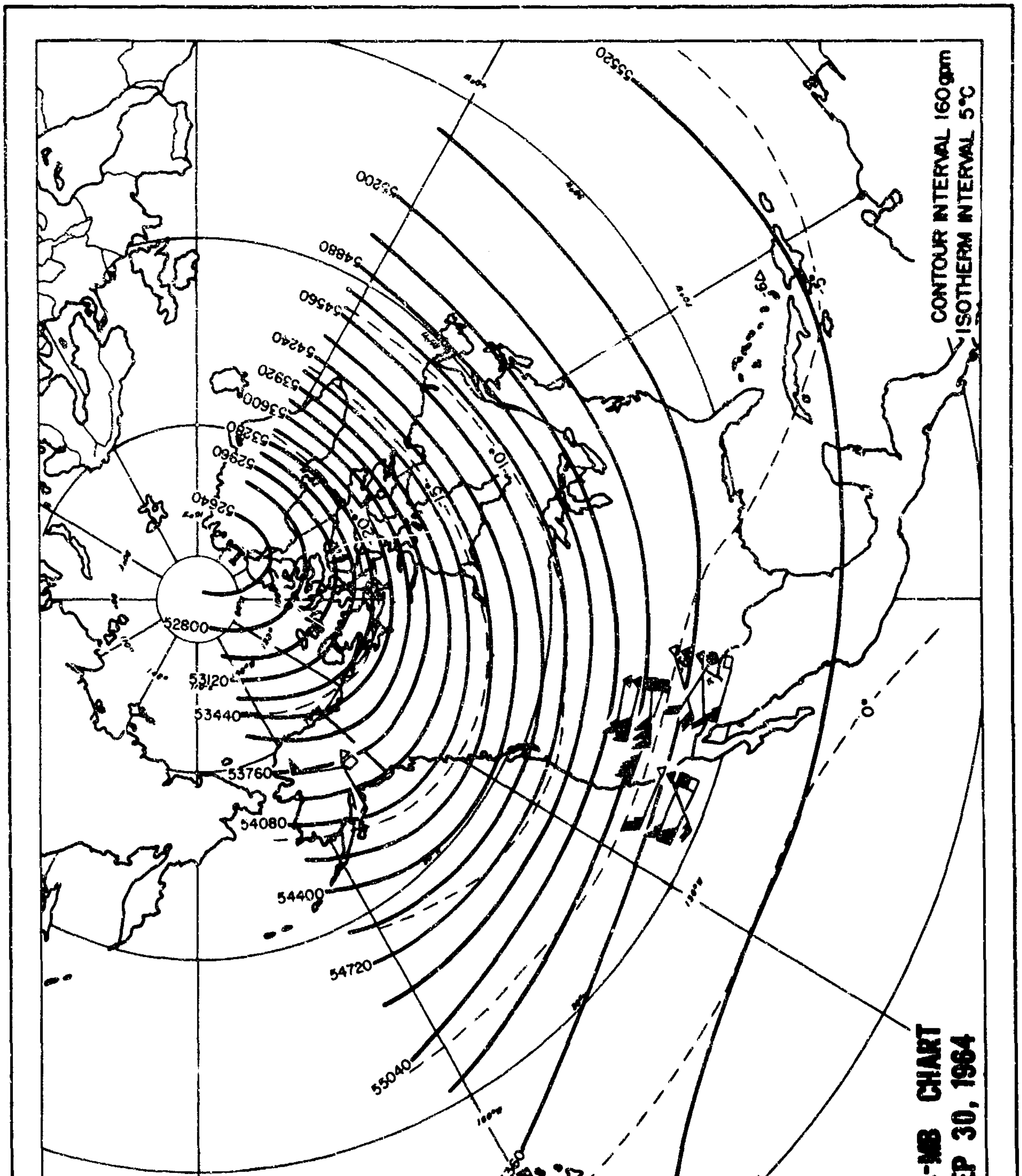

5-MB CHART
SEP 23, 1964
CONTOUR INTERVAL 30gpm
ISOTHERM INTERVAL 5°C

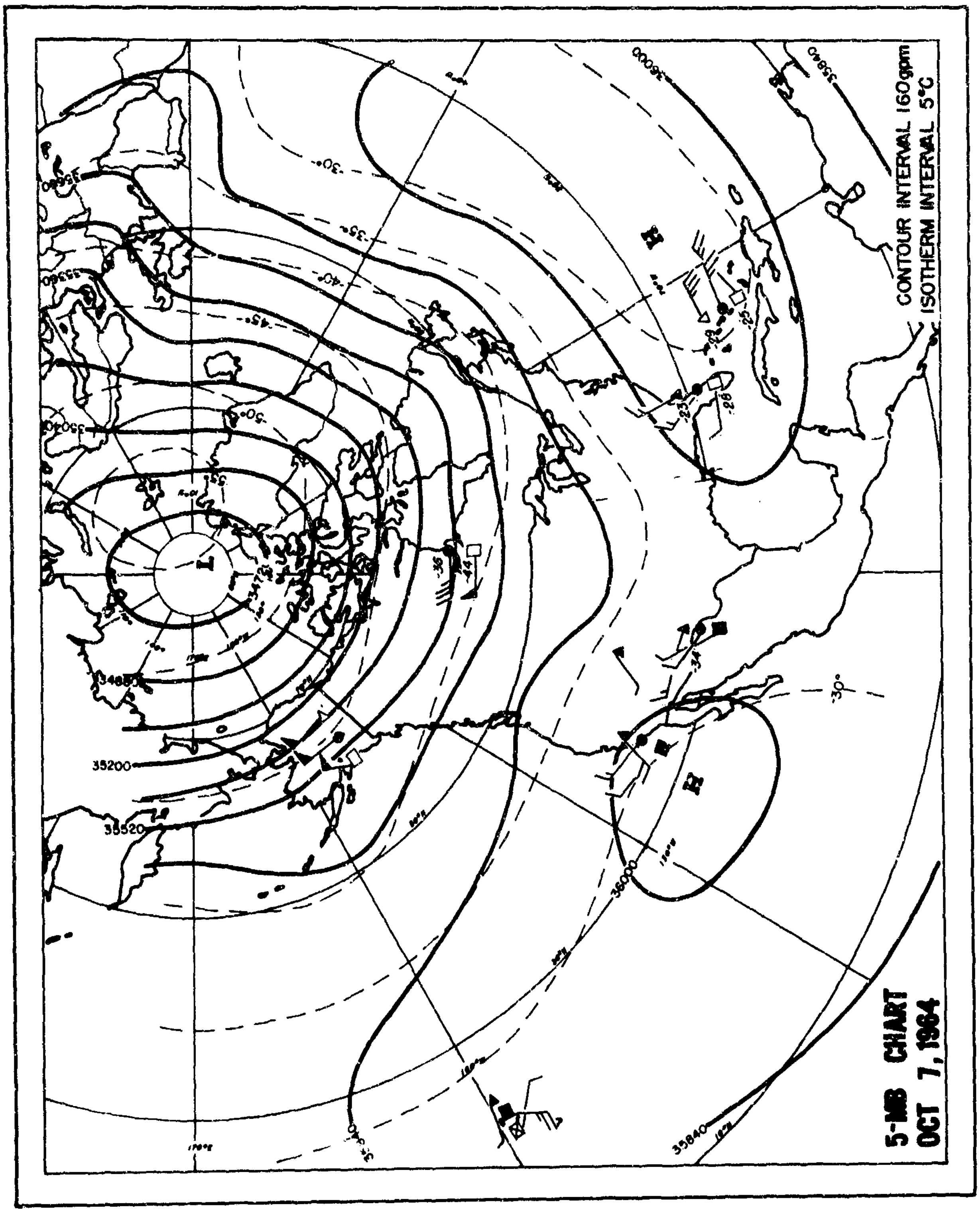

2-MB CHART
SEP 23, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C

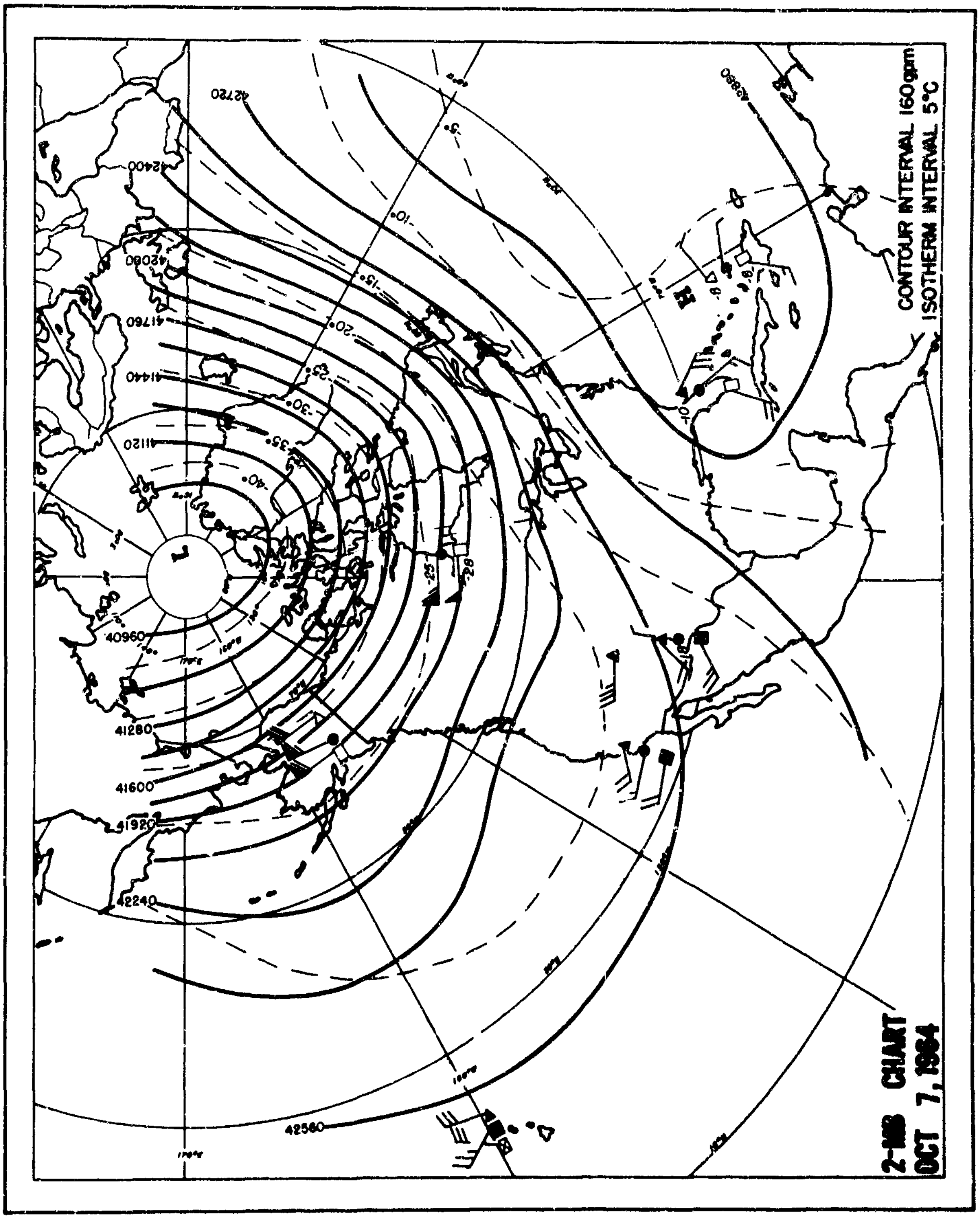

0.4-MB CHART
SEP 23, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C

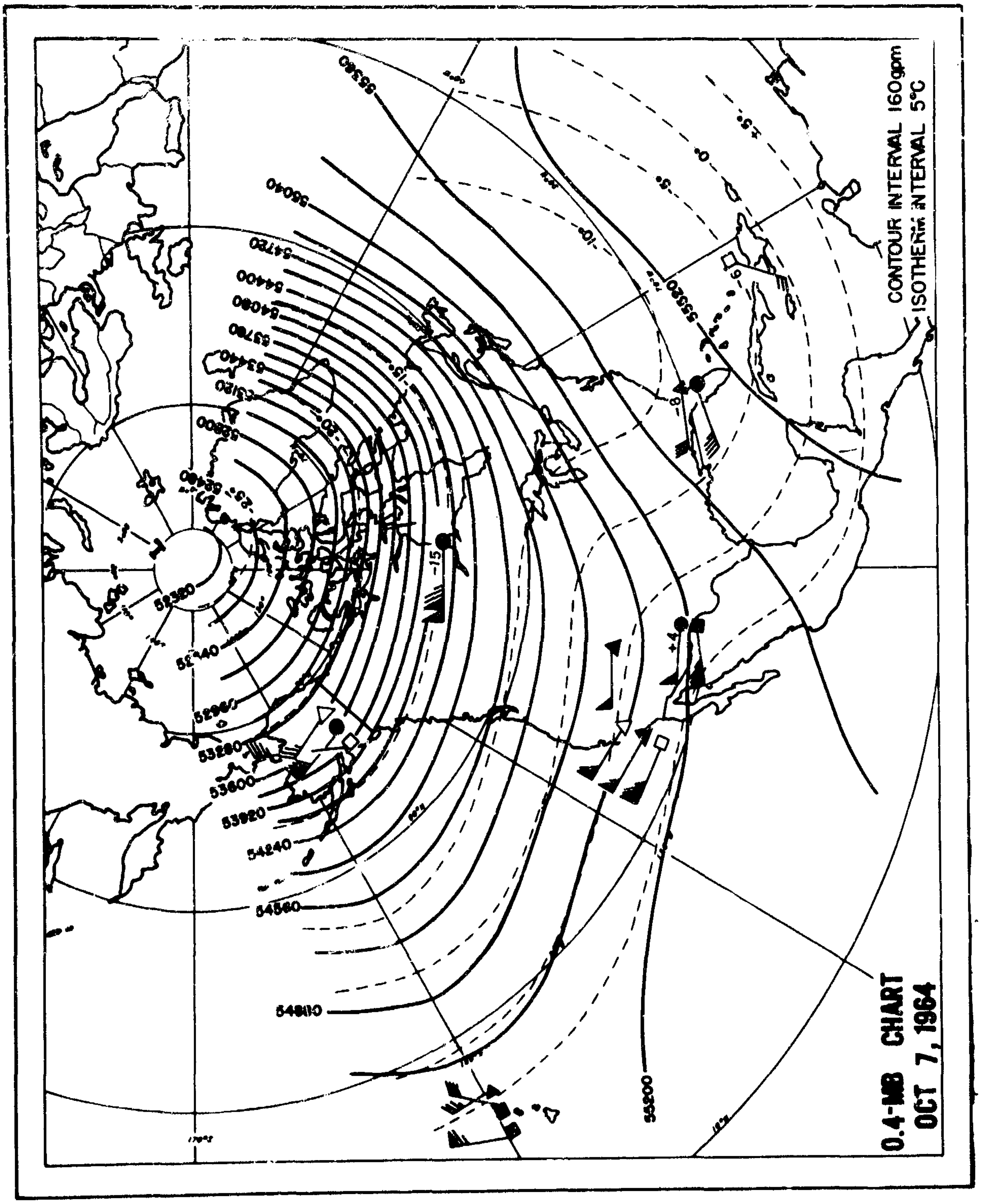

5-MB CHART
SEP 30, 1964
CONTOUR INTERVAL 160 gpm
ISOTHERM INTERVAL 5°C

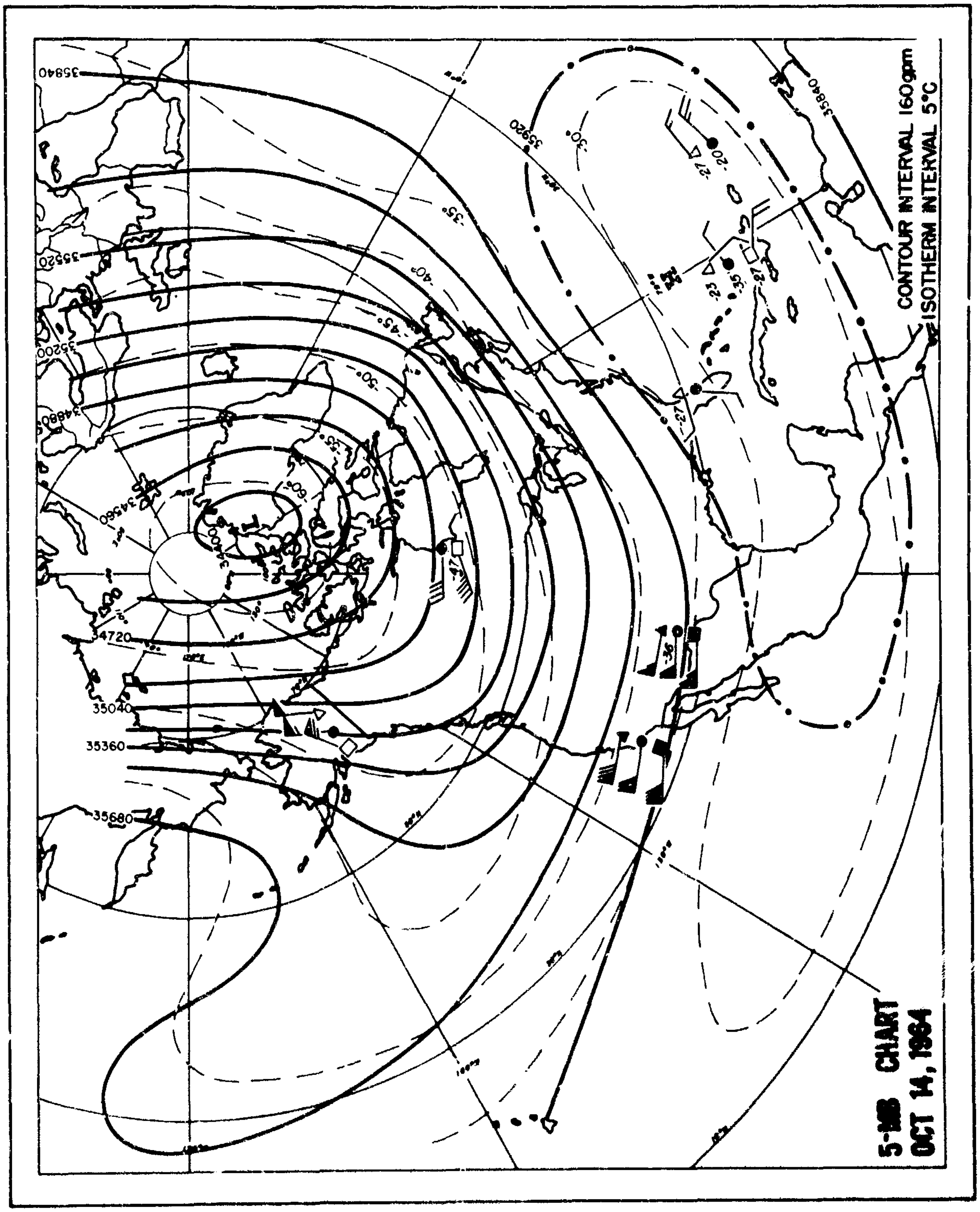

2-MB CHART
SEP 30, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C

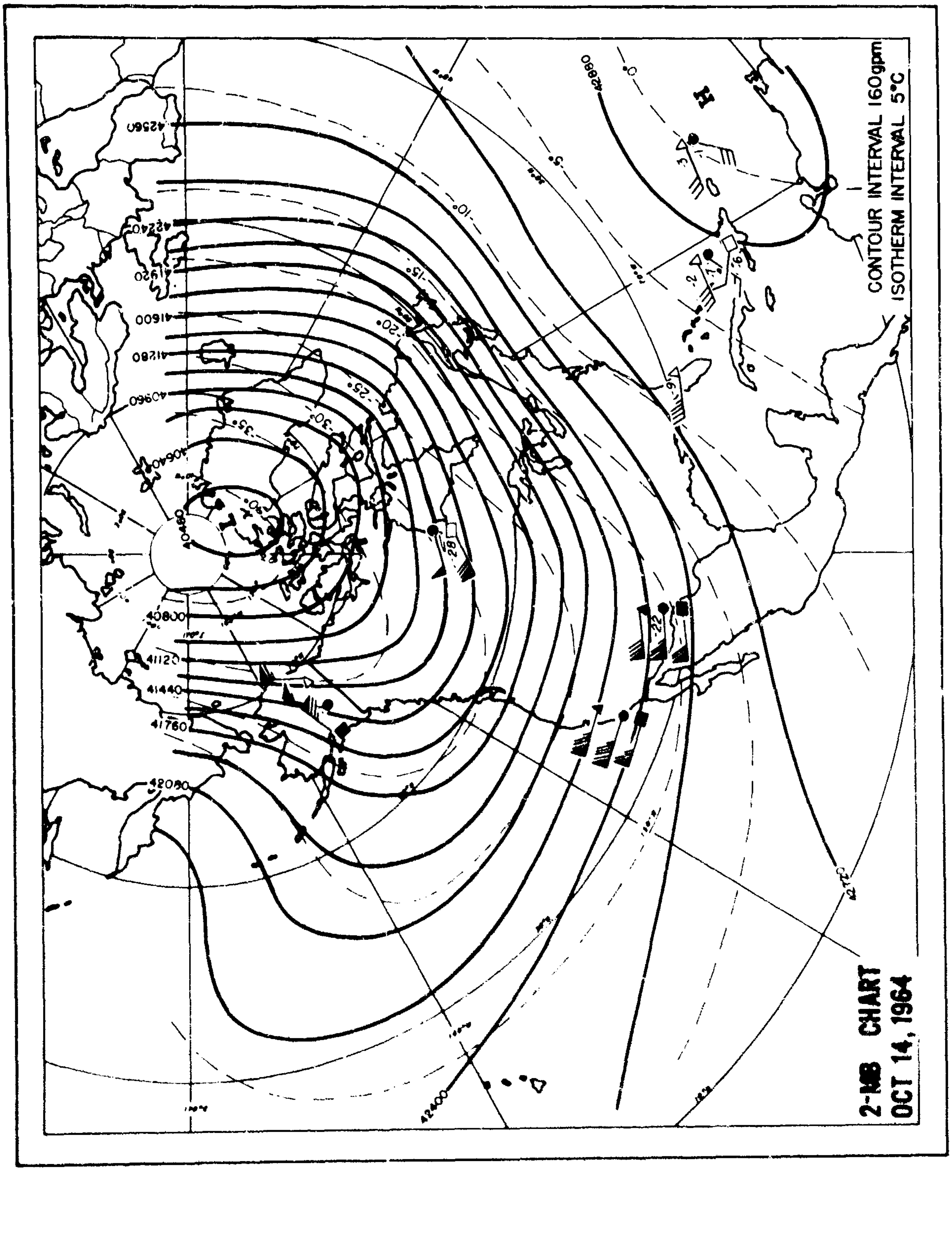

0.4-MB CHART
SEP 30, 1964
CONTOUR INTERVAL 160 gpm
ISOTHERM INTERVAL 5°C
52640
52800
52960
53120
53280
53440
53600
53760
53920
54080
54240
54400
54560
54720
54880
55040
55200
55360
55520

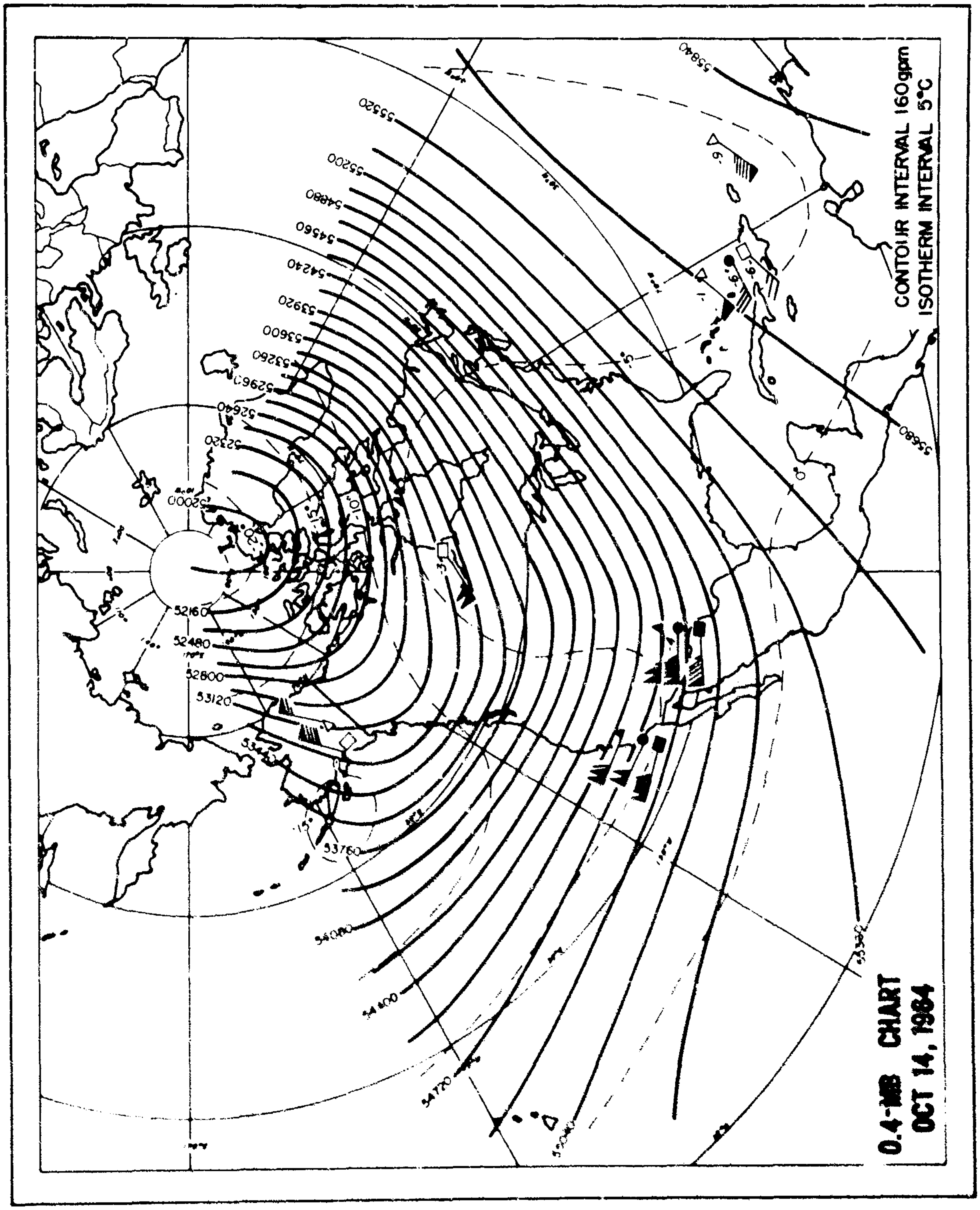

5-MB CHART
OCT 7, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
35200
35520
36000
35840
-30°
-35°
-40°
-45°
-50°

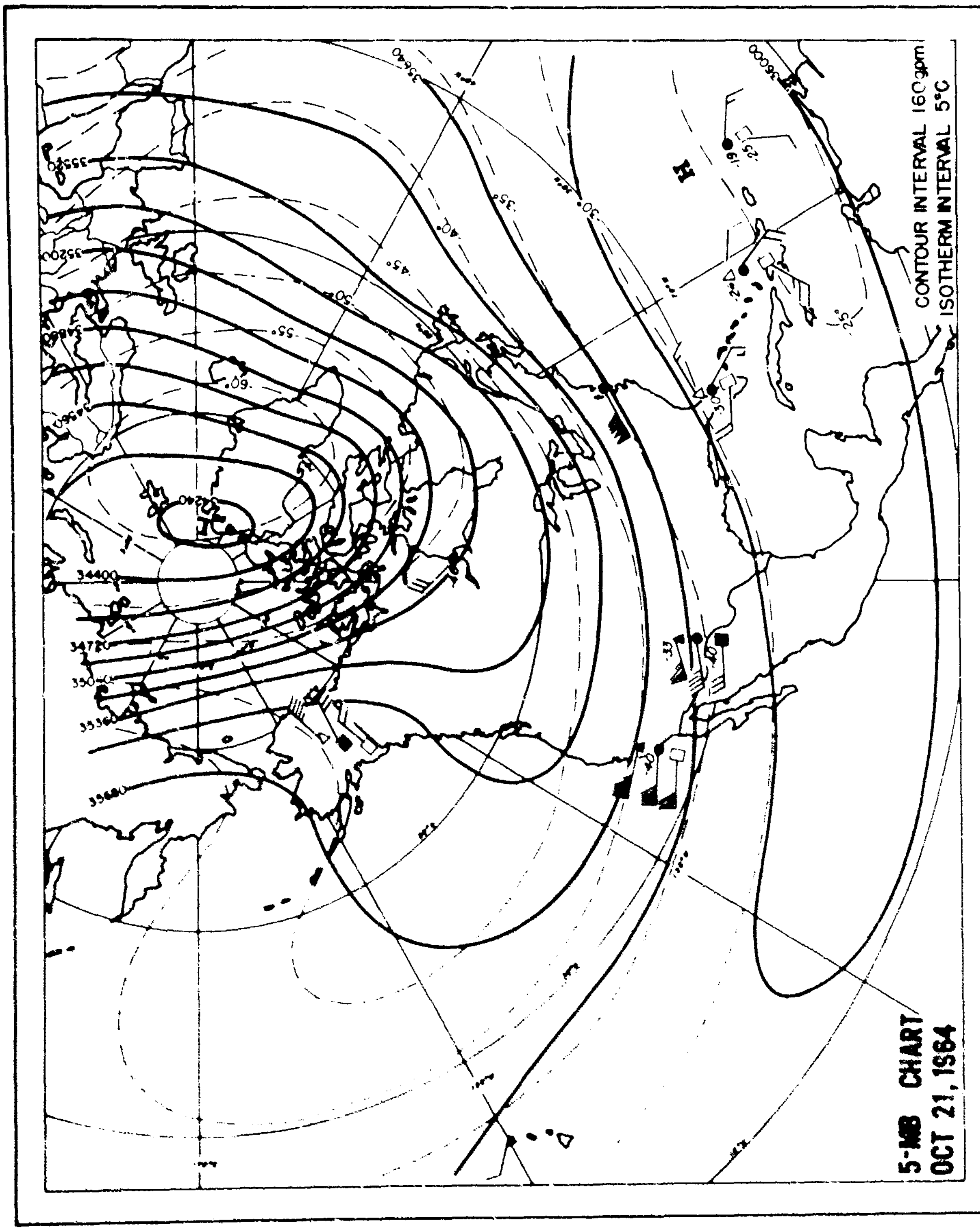

2-MB CHART
OCT 7, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
40960
41120
41280
41440
41600
41760
41920
42080
42240
42400
42560
42720

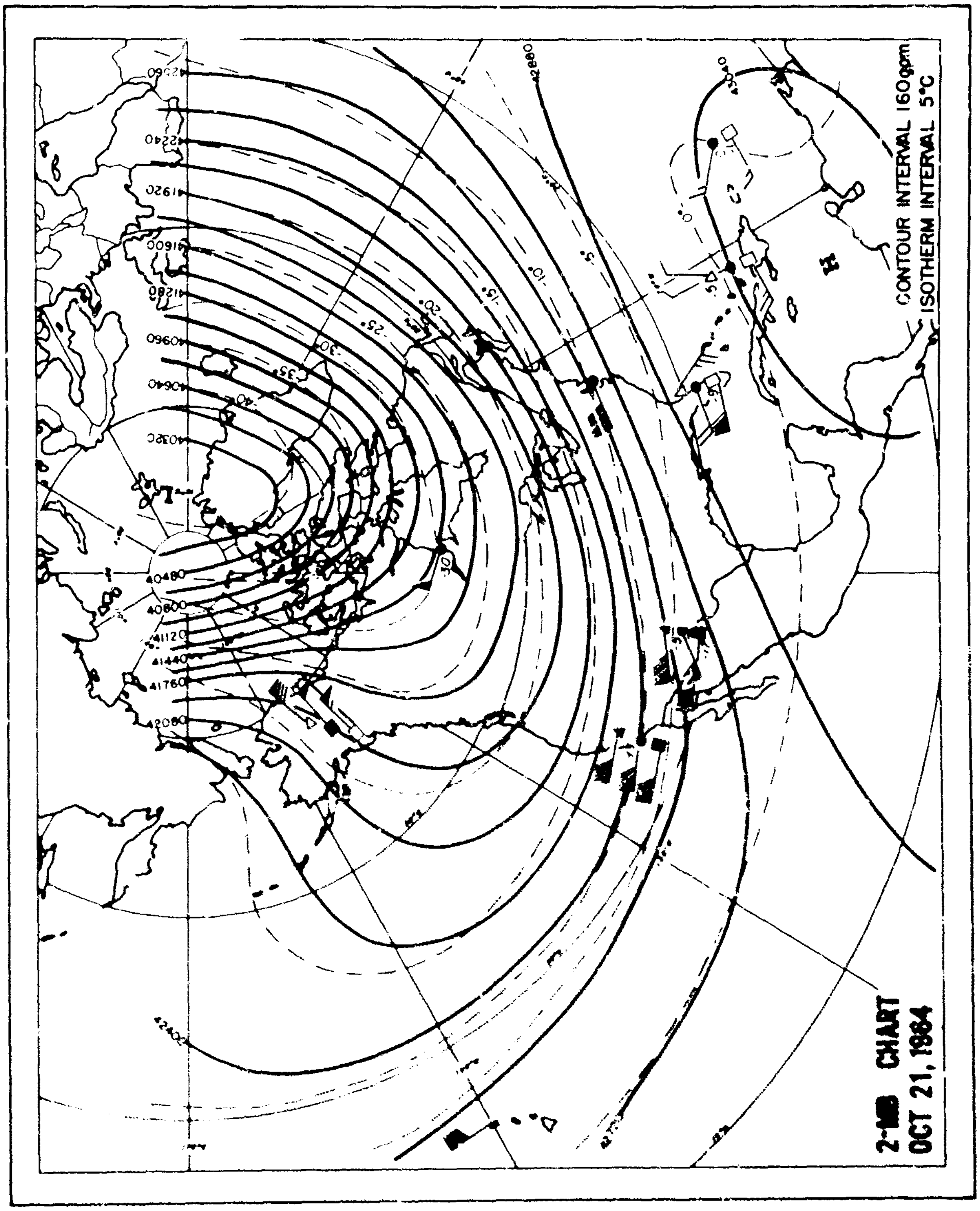

0.4-MB CHART
OCT 7, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C

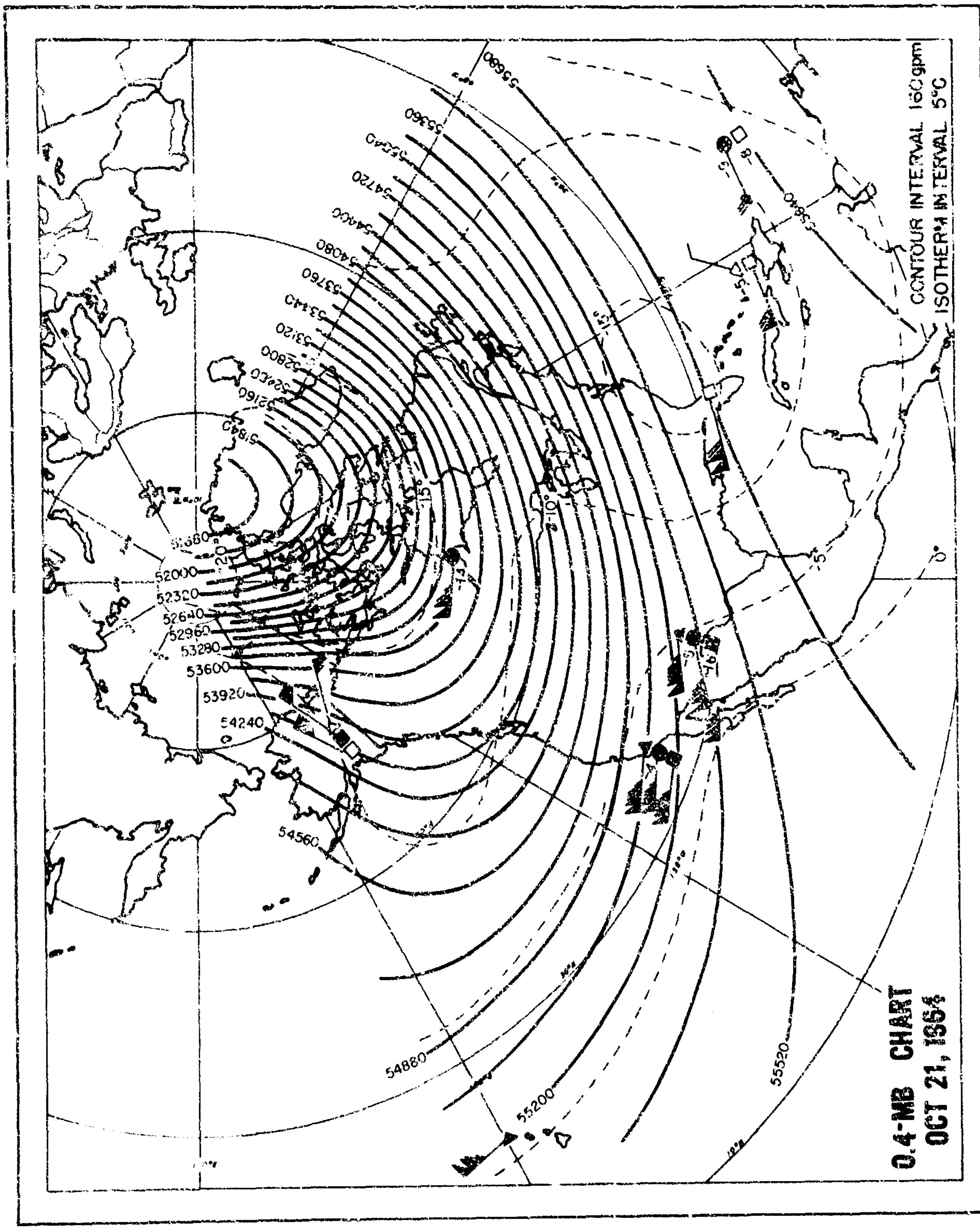

5-MB CHART
OCT 14, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
35840
35520
35200
34880
34560
34720
35040
35360
35680
35920
35840

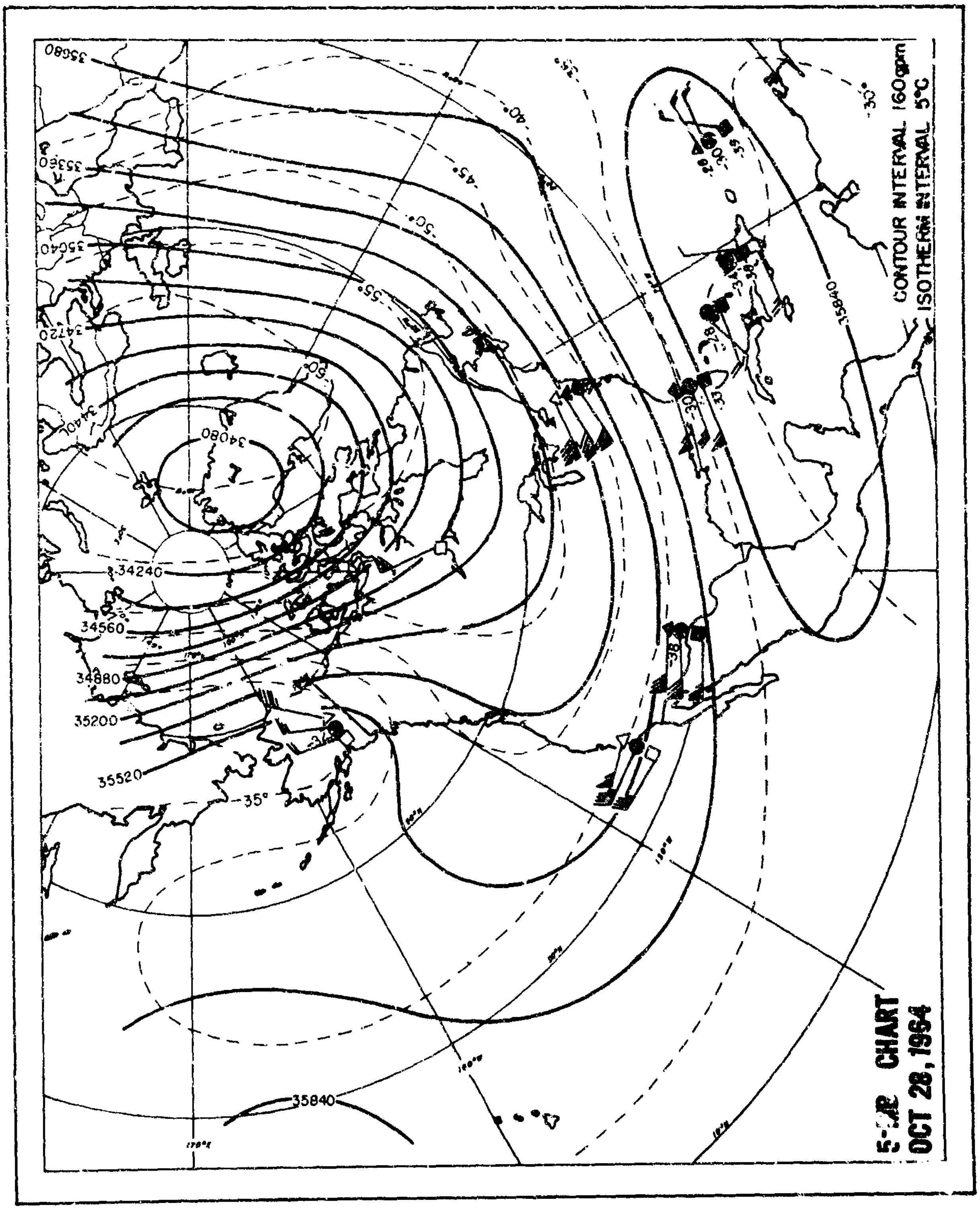

CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
2-MB CHART
OCT 14, 1964


0.4-MB CHART
OCT 14, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C

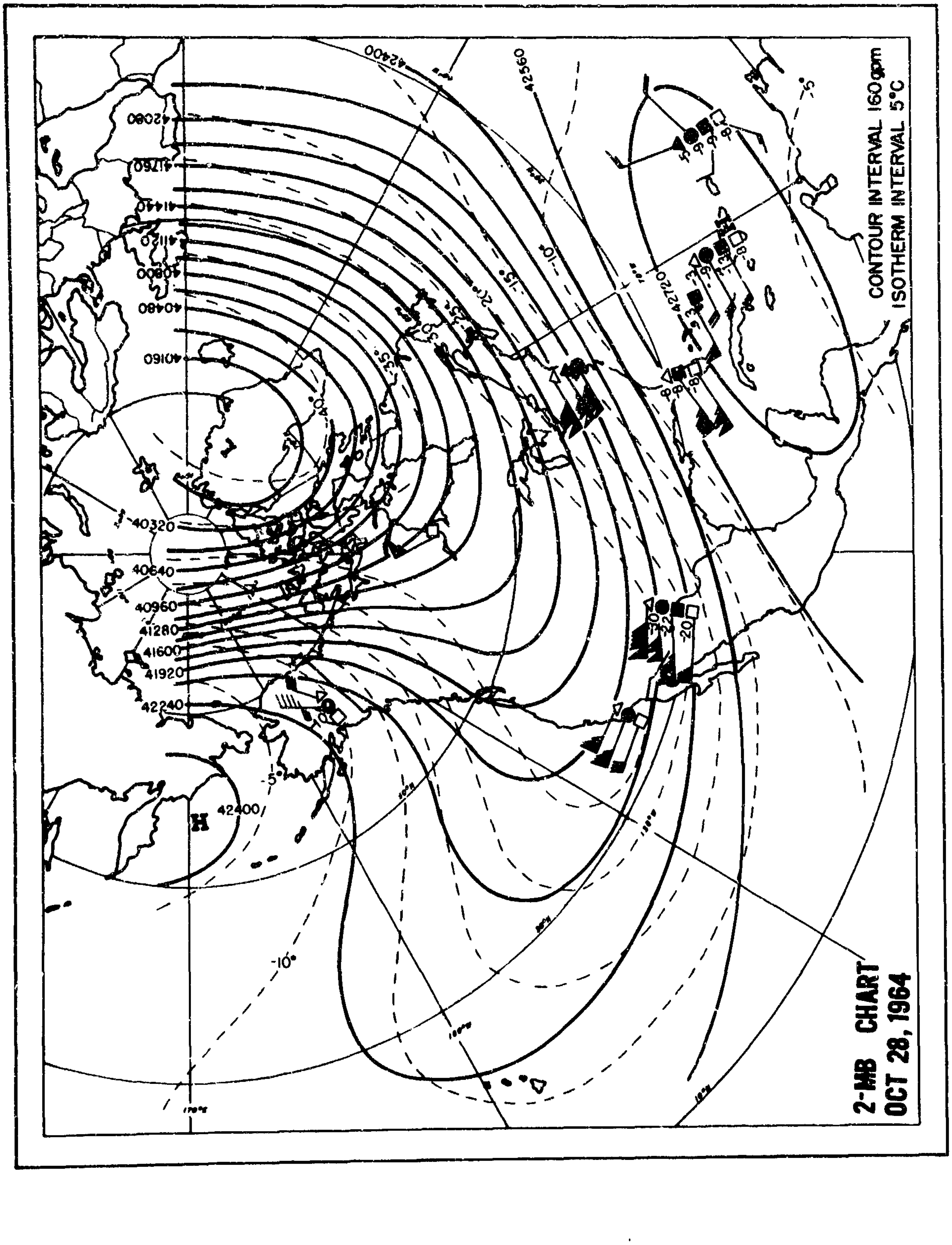

5-MB CHART
OCT 21, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
H

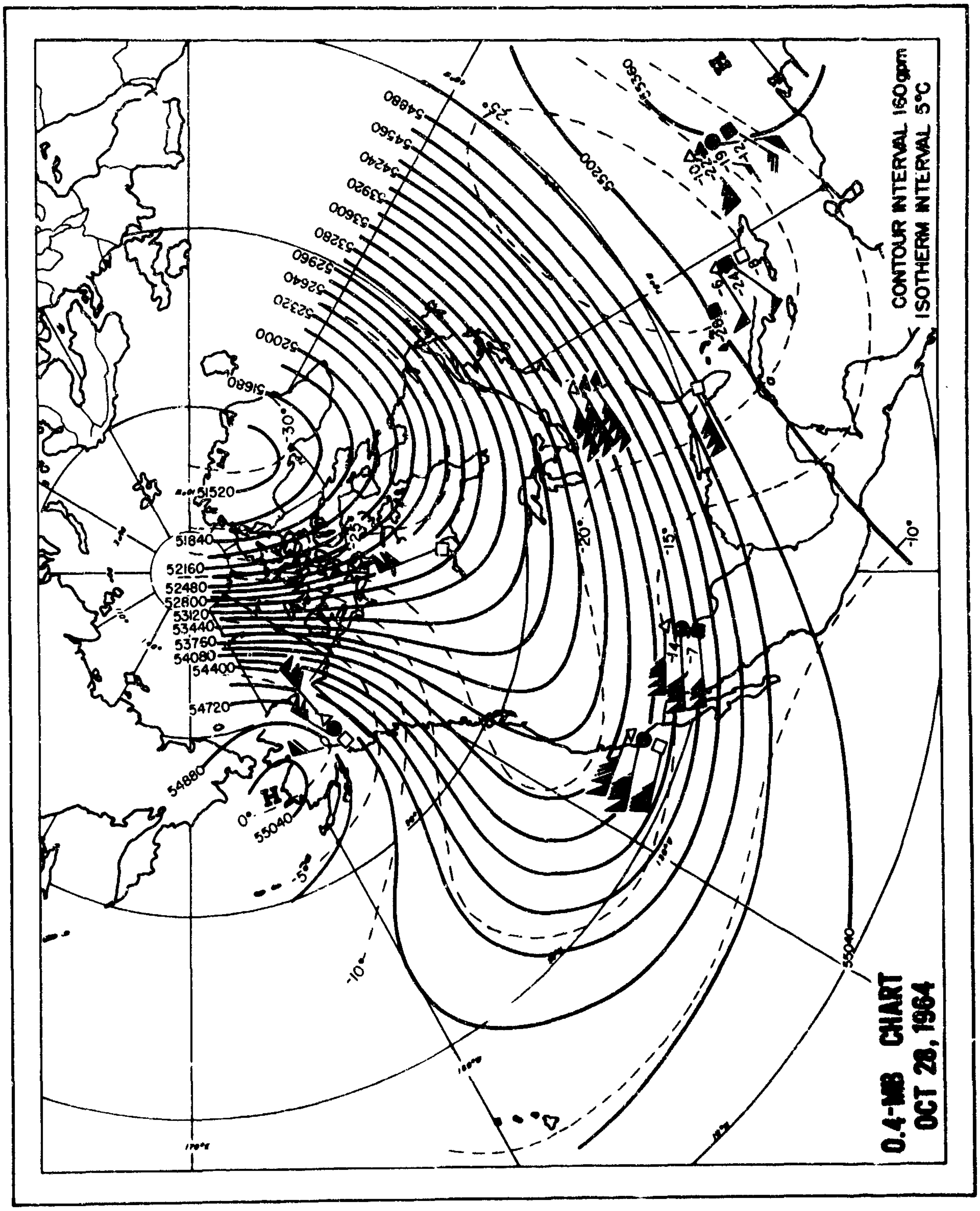

2-MB CHART
OCT 21, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C

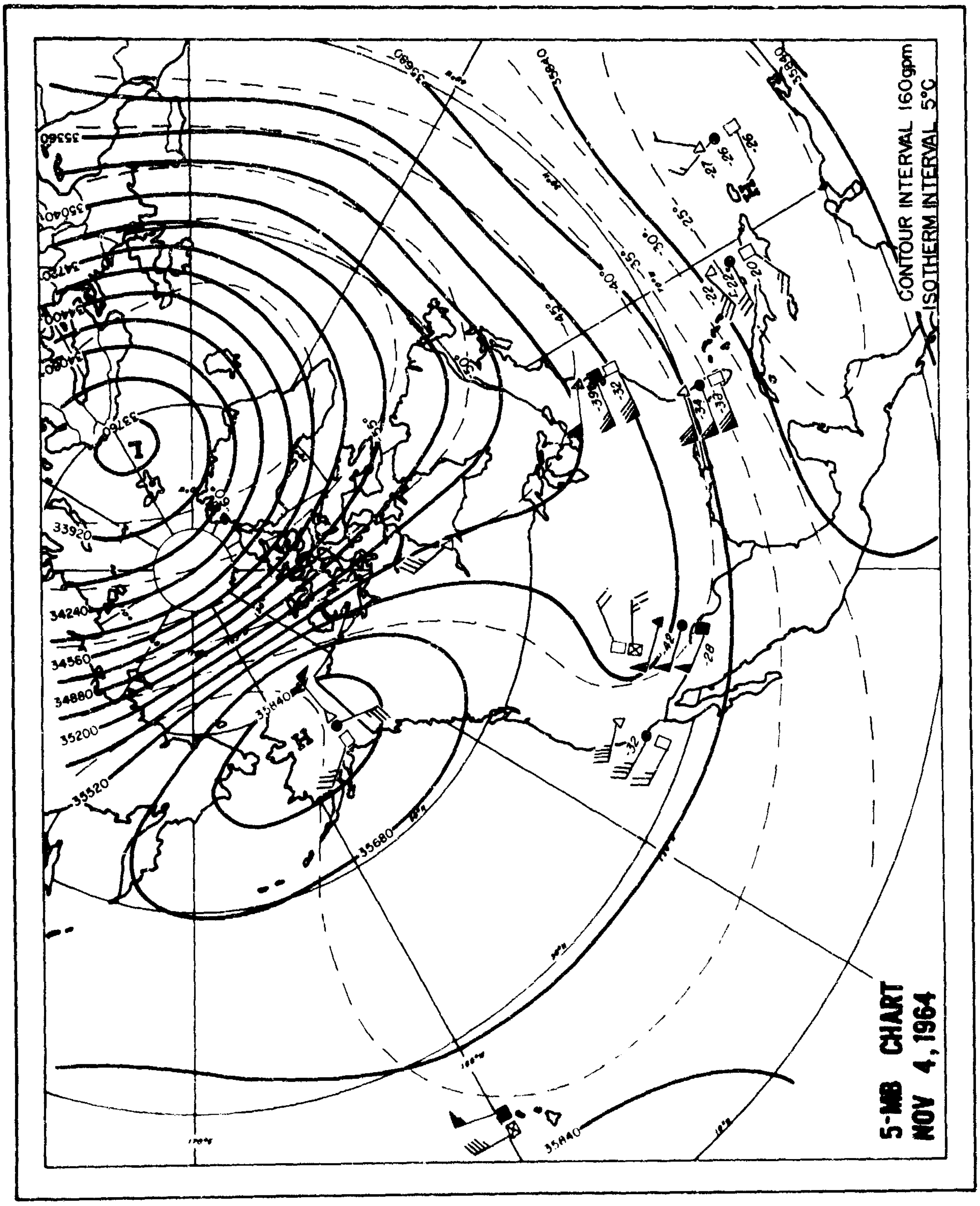

0.4-MB CHART
OCT 21, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C



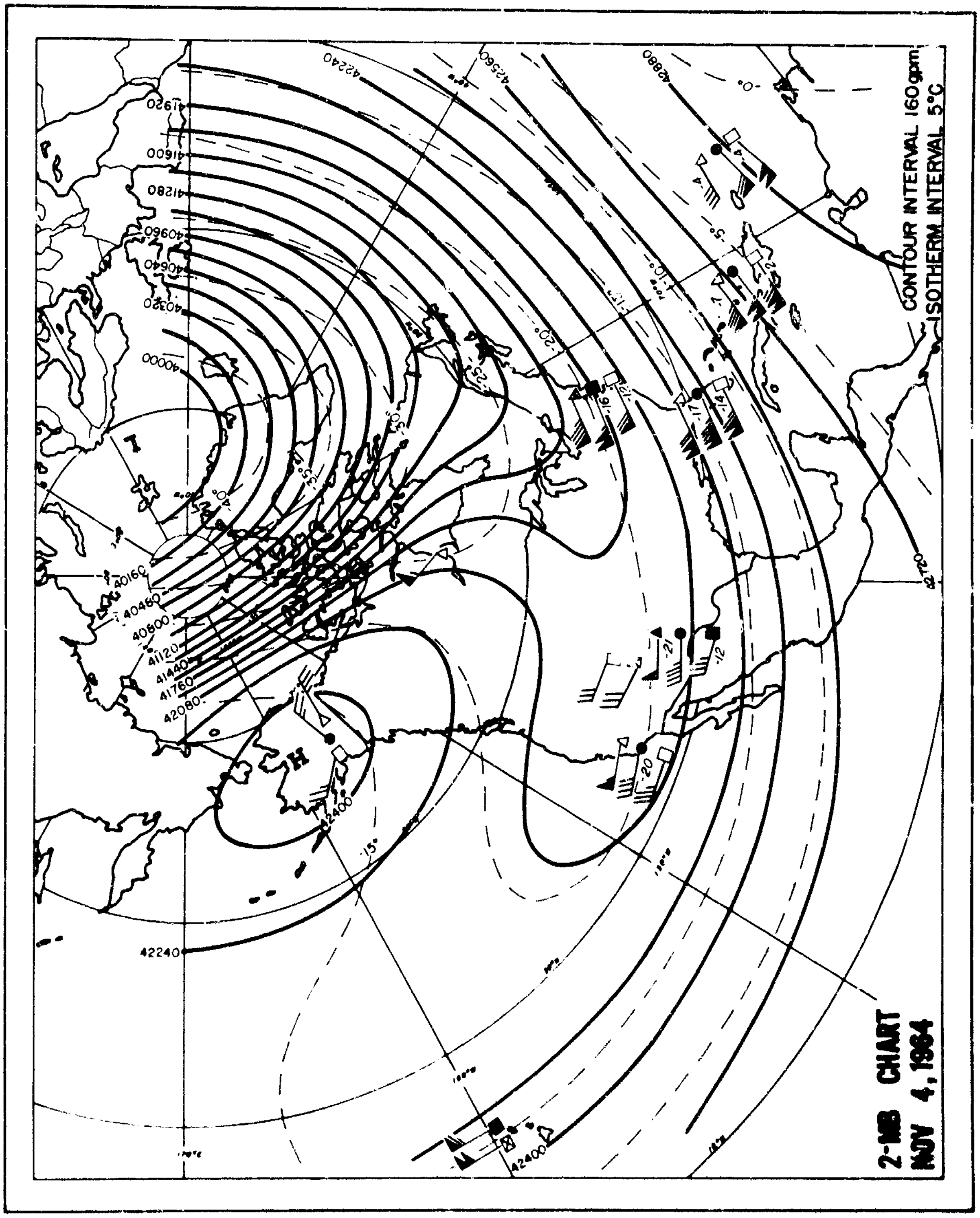
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
CHART
OCT 28, 1964
35680
35360
35040
34720
34400
34080
34240
34560
34880
35200
35520
35840
-35°
-40°
-45°
-50°
-55°
-60°
-30°

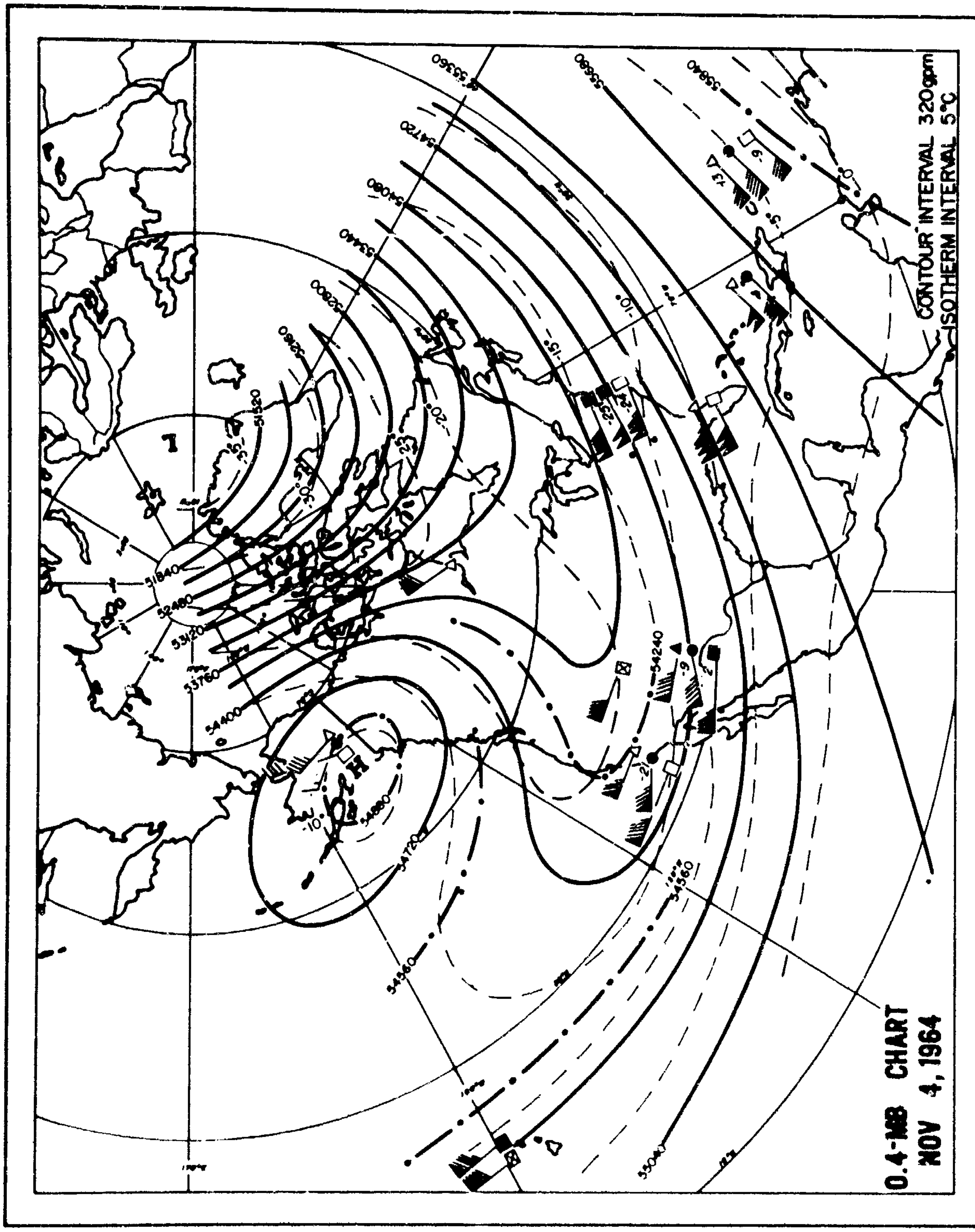

2-MB CHART
OCT 28, 1964
CONTOUR INTERVAL 160 gpm
ISOTHERM INTERVAL 5°C
42400
42560
42080
41760
41440
41120
40800
40480
40160
40320
40640
40960
41280
41600
41920
42240
42720
42400
H
-5°
-10°
-15°
-35°
-40°

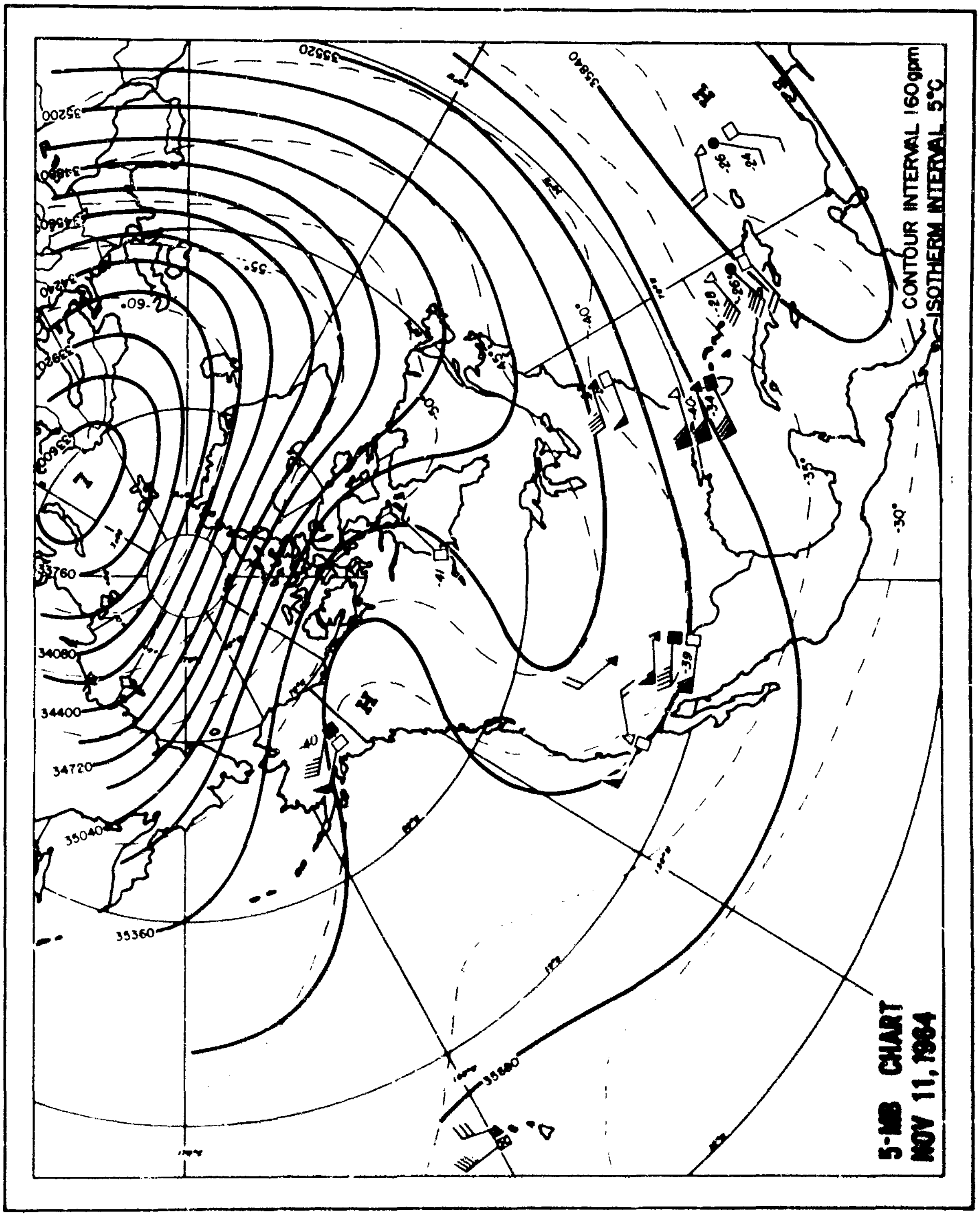

0.4-MB CHART
OCT 28, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
51520
51840
52160
52480
52800
53120
53440
53760
54080
54400
54720
54880
55040
51680
52000
52320
52640
52960
53280
53600
53920
54240
54560
54880
55200
-30°
-25°
-20°
-15°
-10°
-5°
0°
H
L

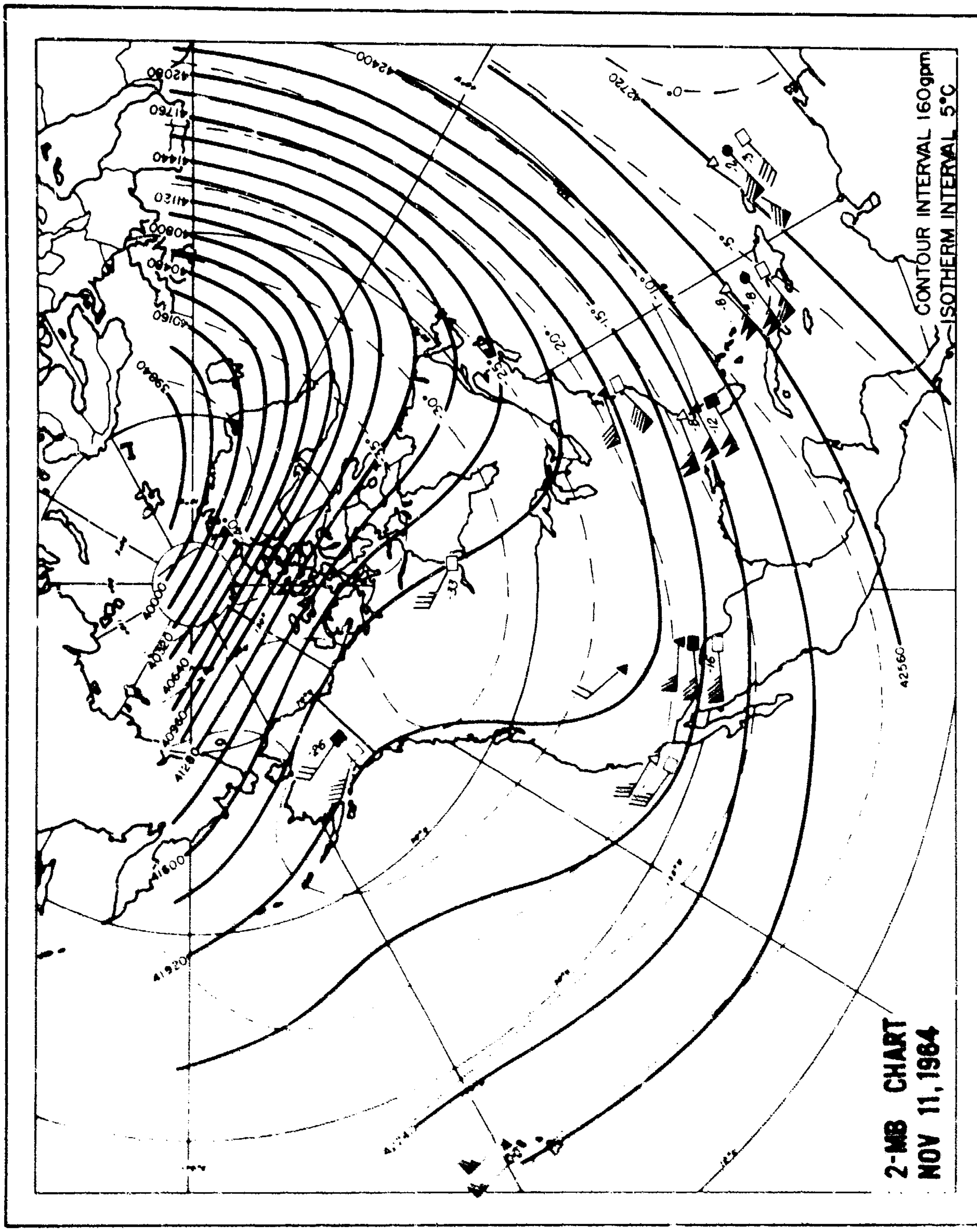


5-MB CHART
NOV 4, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
L
H
33760
33920
34240
34560
34880
35200
35520
35680
35840

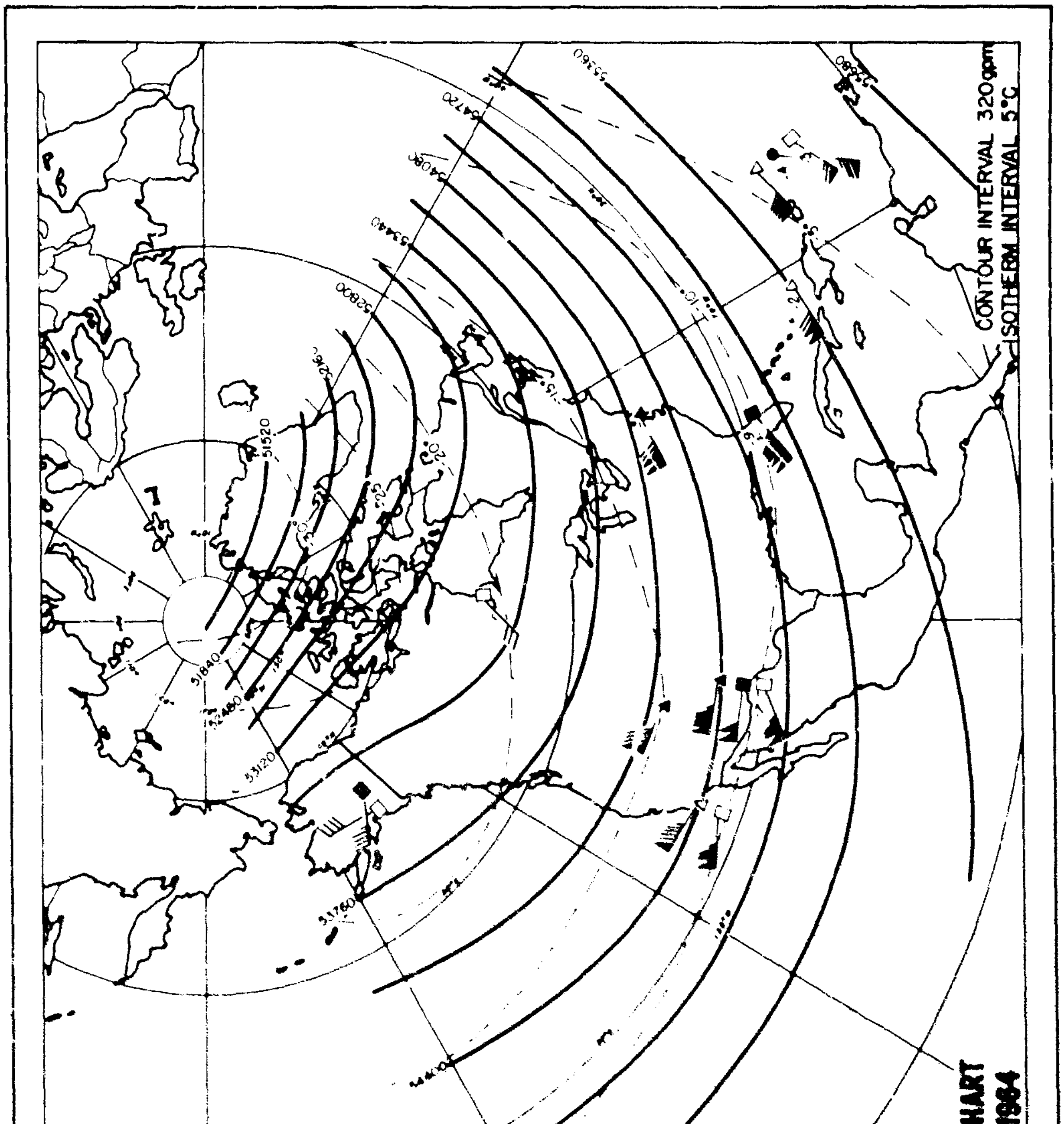

CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C
2-MB CHART
NOV 4, 1964

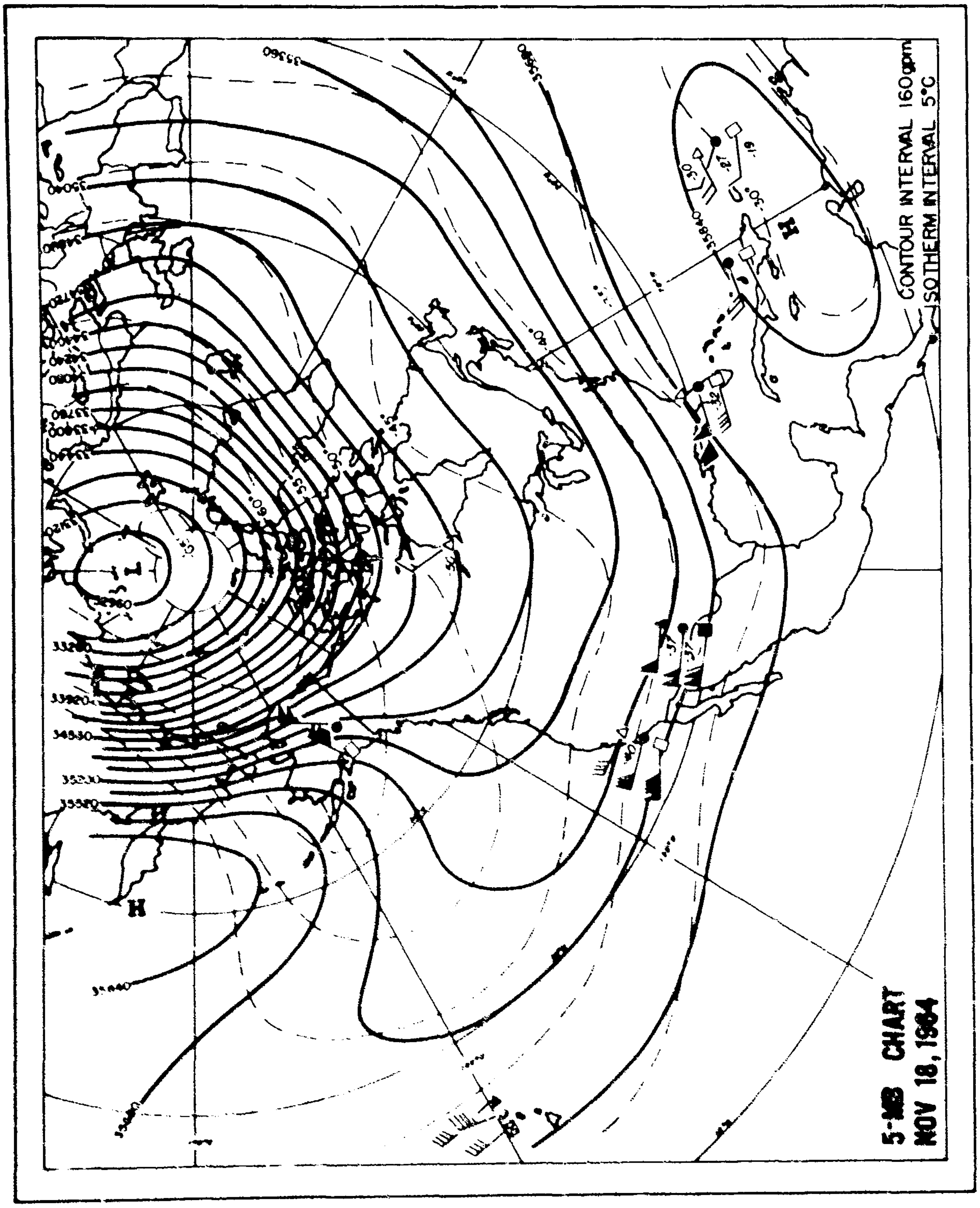

0.4-MB CHART
NOV 4, 1964
CONTOUR INTERVAL 320gpm
ISOTHERM INTERVAL 5°C

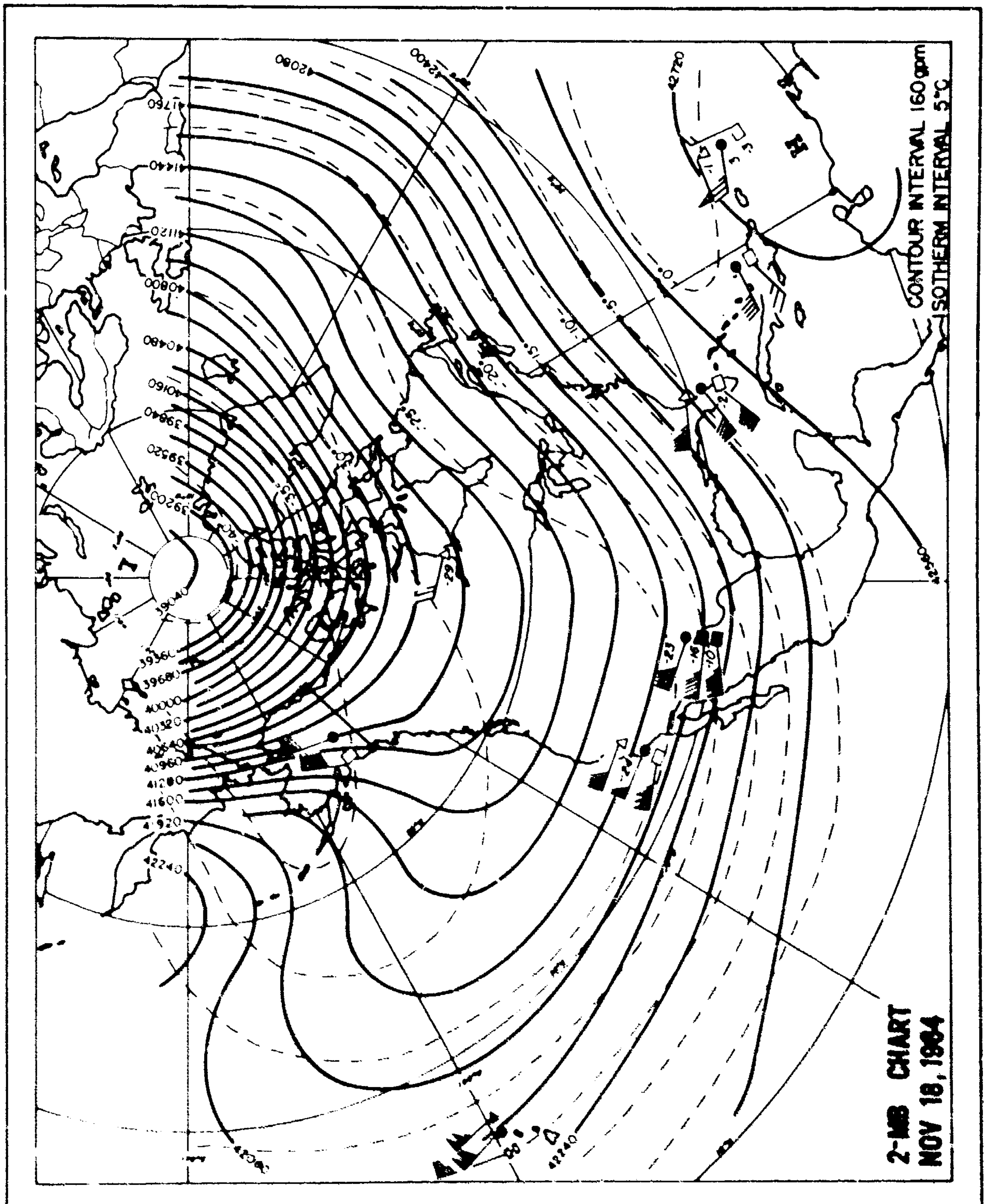

5-MB CHART
NOV 11, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C

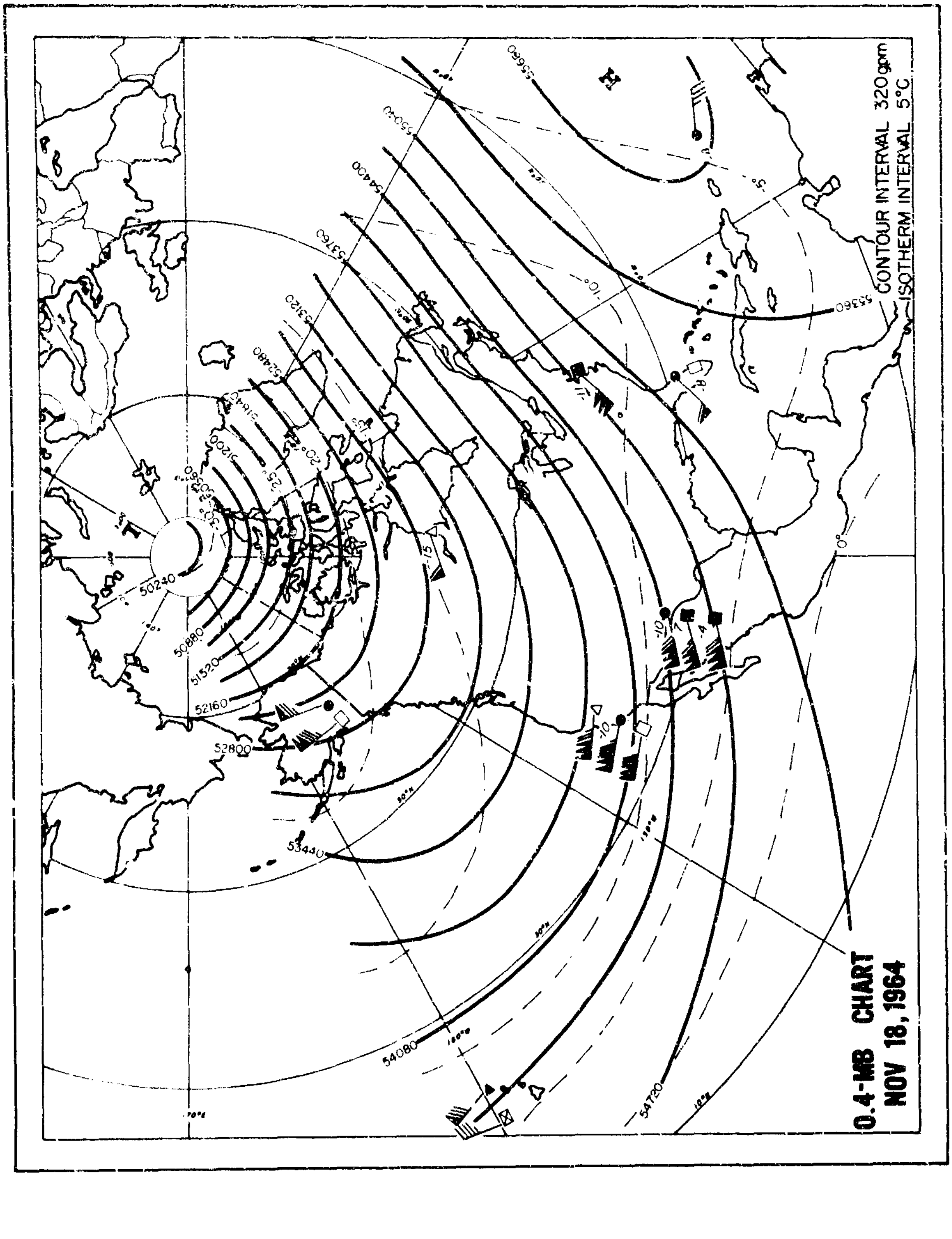


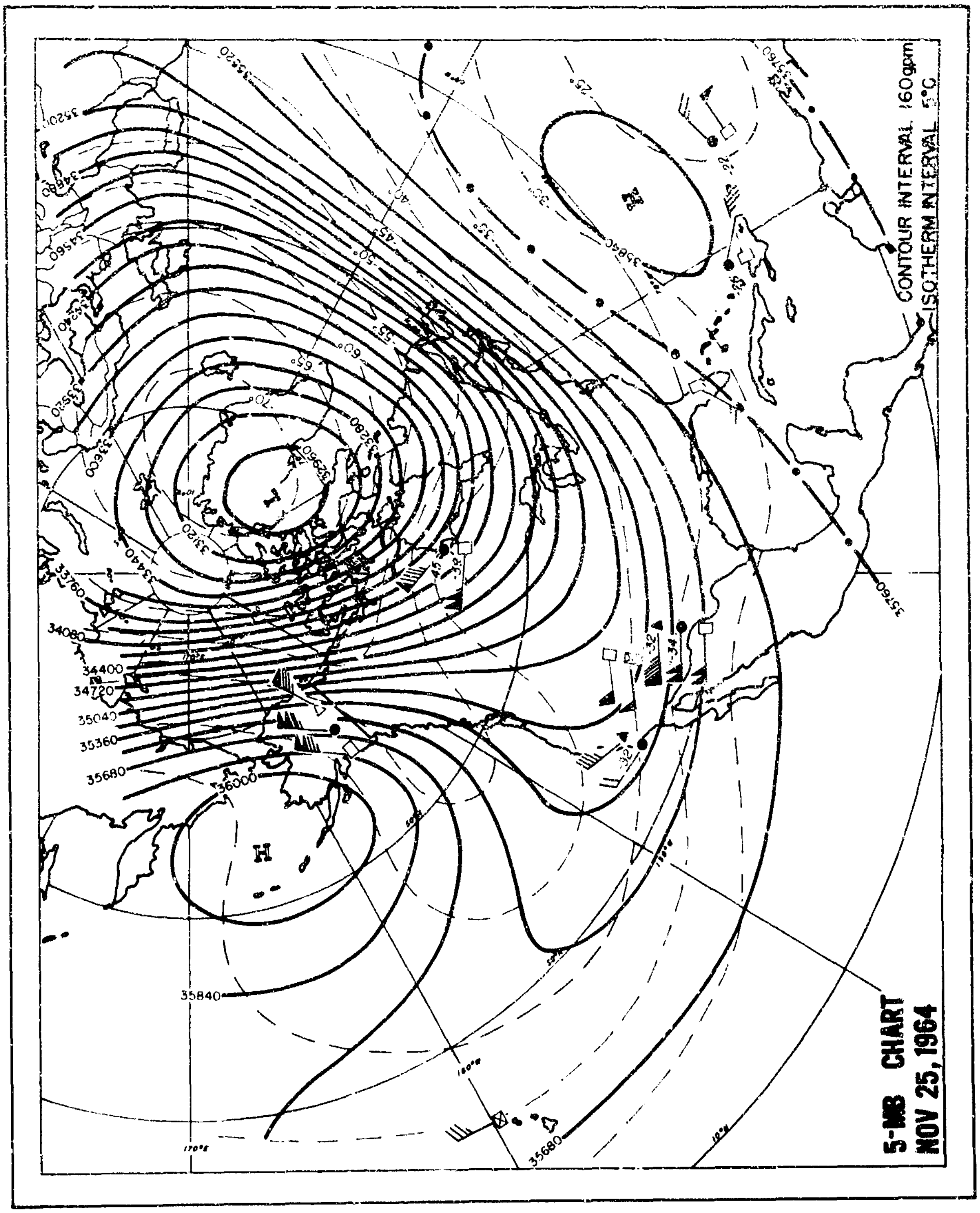
2-MB CHART
NOV 11, 1984
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C

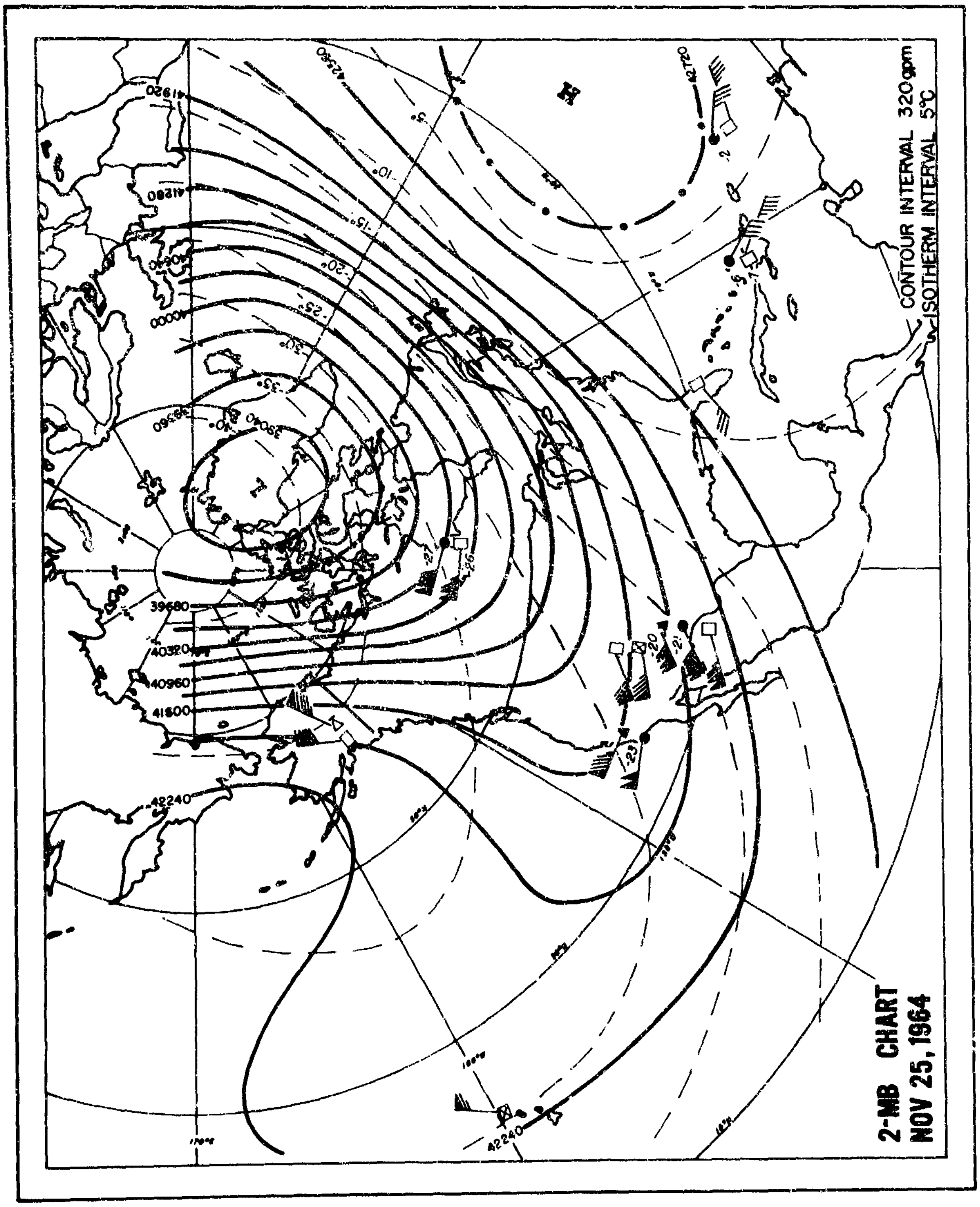

0.4-MB CHART
NOV 11, 1964
CONTOUR INTERVAL 320gpm
ISOTHERM INTERVAL 5°C

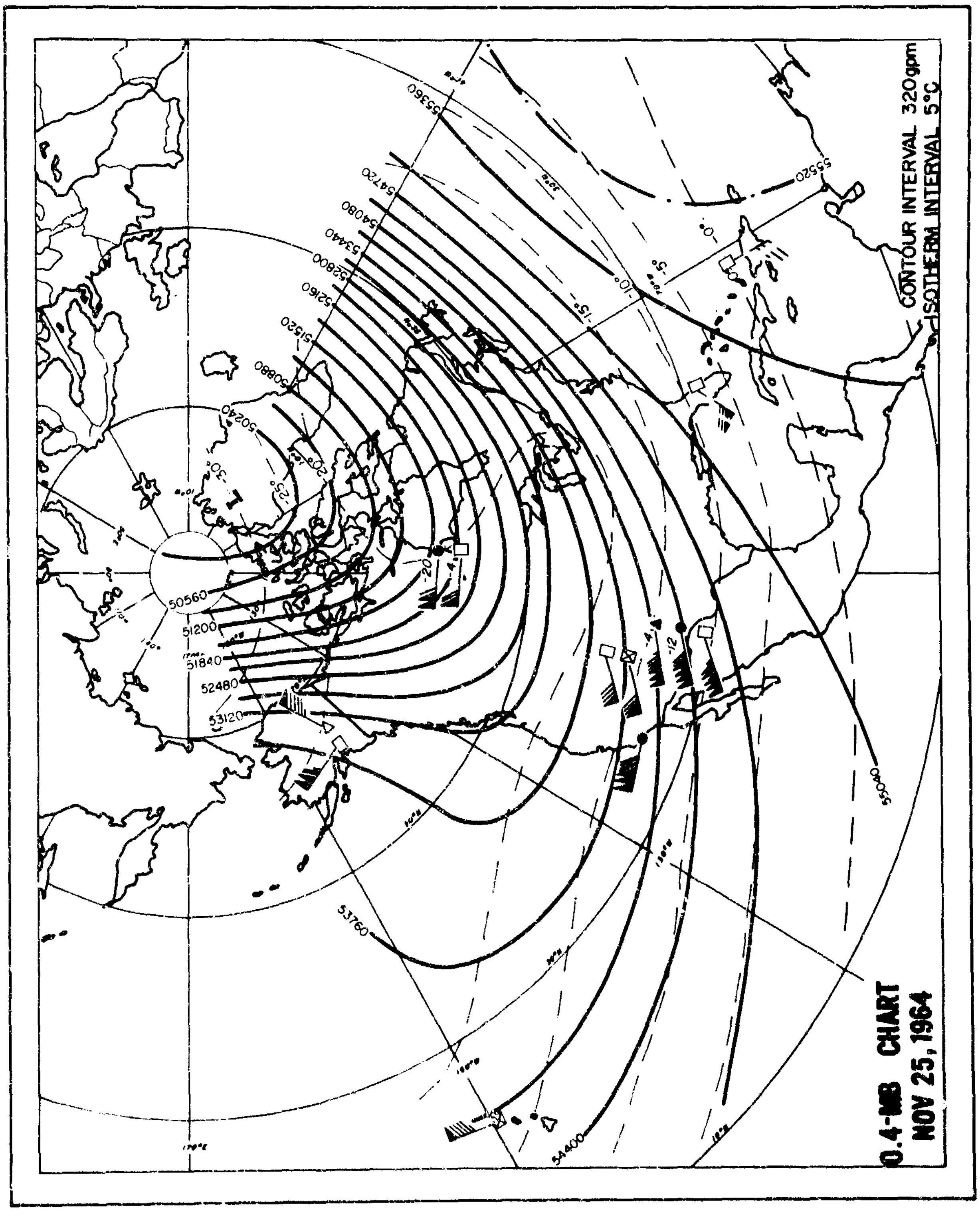

5-MB CHART
NOV 18, 1964
CONTOUR INTERVAL 160gpm
ISOTHERM INTERVAL 5°C

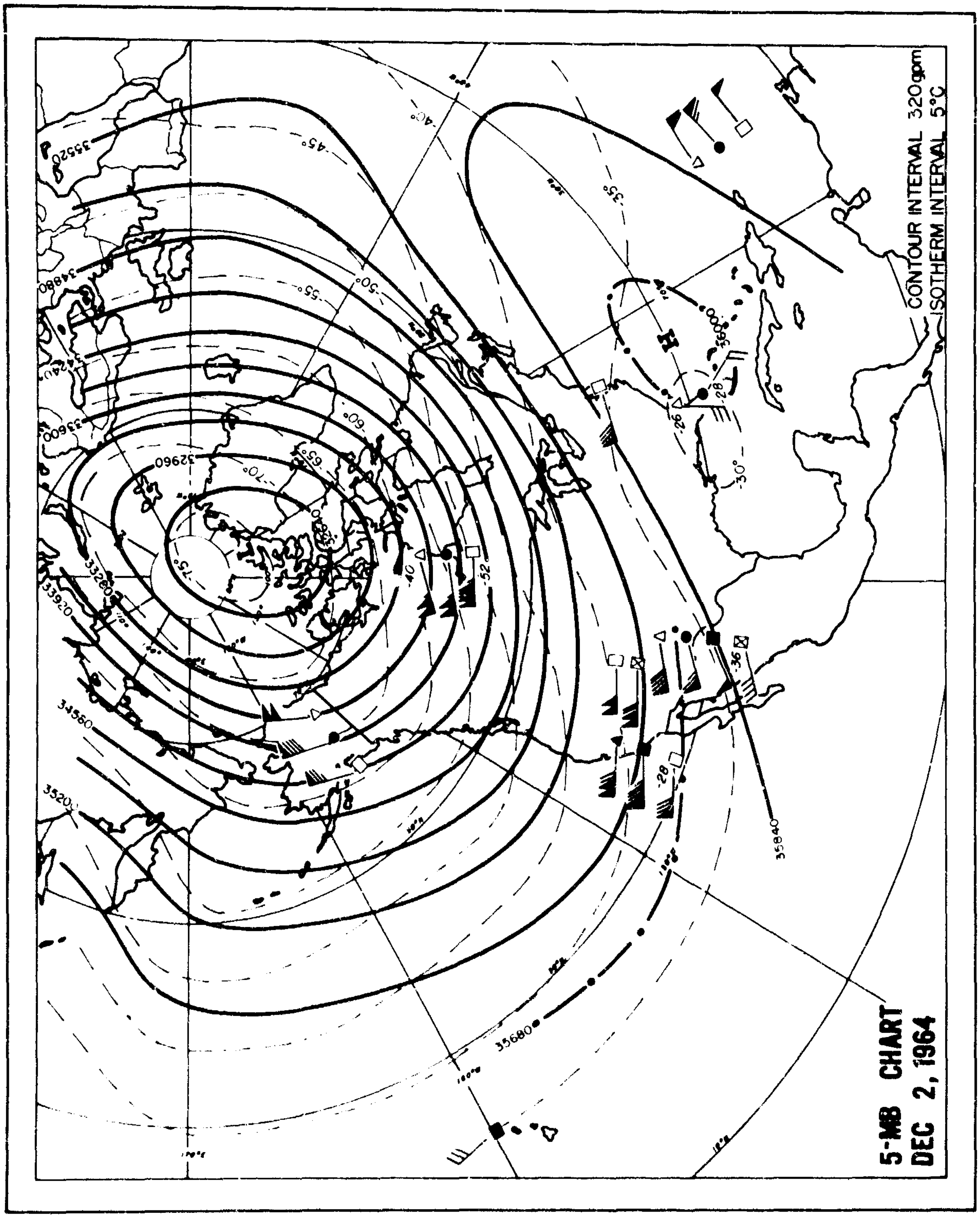

2-MB CHART
NOV 18, 1964
CONTOUR INTERVAL 160 gpm
ISOTHERM INTERVAL 5°C

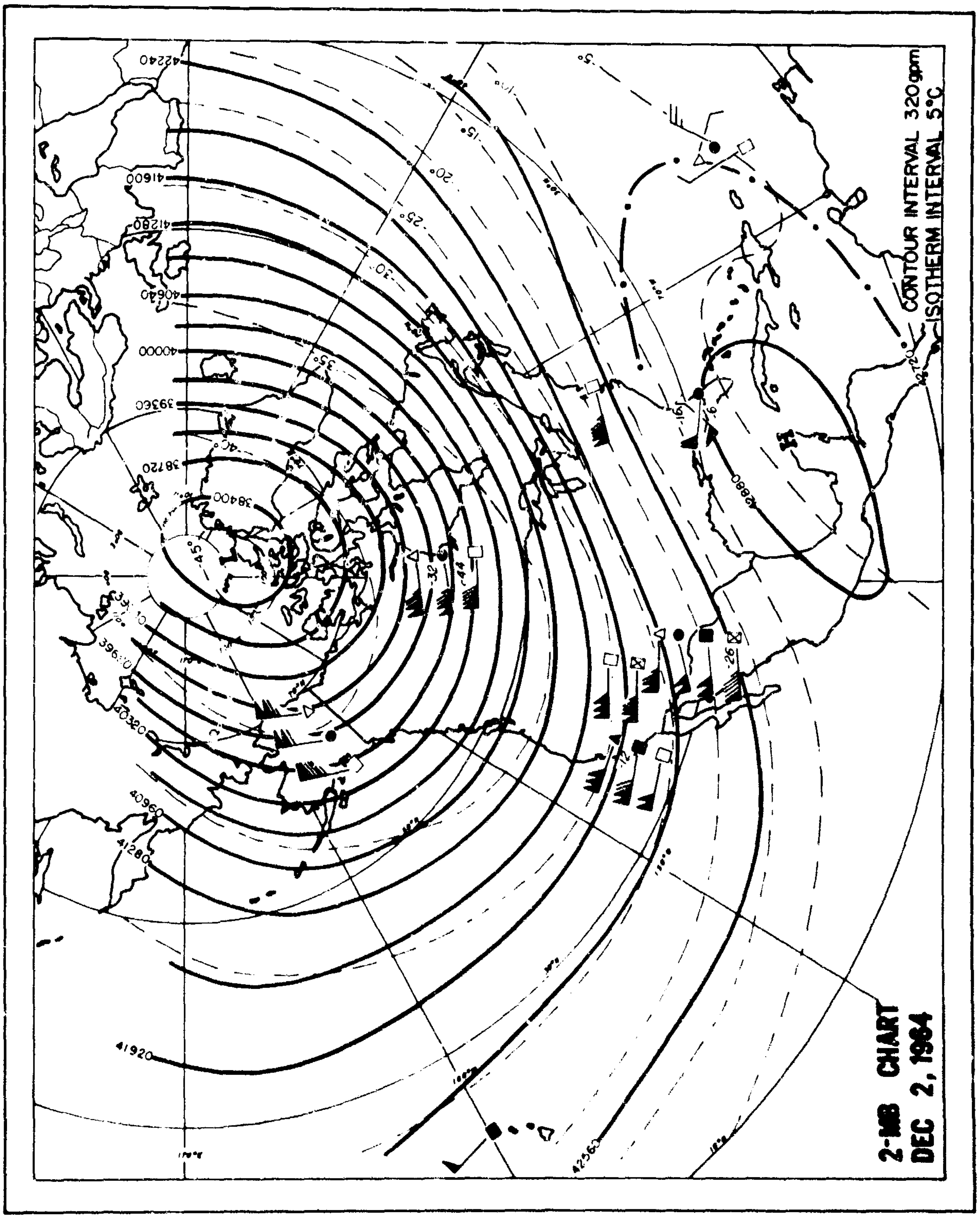

0.4-MB CHART
NOV 18, 1964
CONTOUR INTERVAL 320 gpm
ISOTHERM INTERVAL 5°C


5-MB CHART
NOV 25, 1964
CONTOUR INTERVAL 160 gpm
ISOTHERM INTERVAL 5°C
H
L


2-MB CHART
NOV 25, 1964
CONTOUR INTERVAL 320gpm
ISOTHERM INTERVAL 5°C
39680
40320
40960
42240


0.4-MB CHART
NOV 25, 1964
CONTOUR INTERVAL 320gpm
ISOTHERM INTERVAL 5°C
50240
50560
50880
51200
51520
51840
52160
52480
52800
53120
53440
53760
54080
54400
54720
55040
55360
55520


5-MB CHART
DEC 2, 1964
CONTOUR INTERVAL 320gpm
ISOTHERM INTERVAL 5°C


2-MB CHART
DEC 2, 1964
CONTOUR INTERVAL 320 gpm
ISOTHERM INTERVAL 5°C
42240
41600
41280
40640
40000
39360
38720
38400
40320
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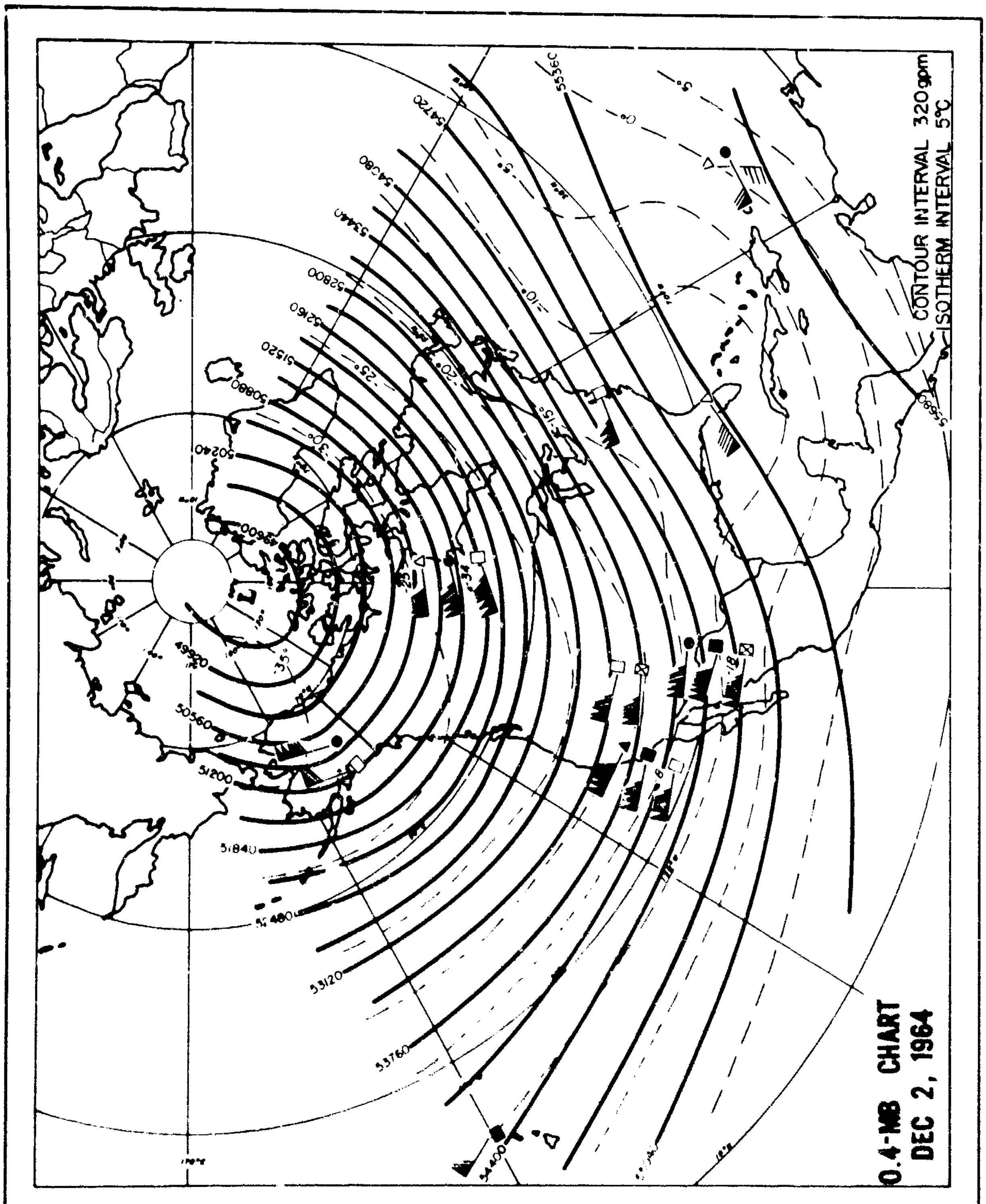
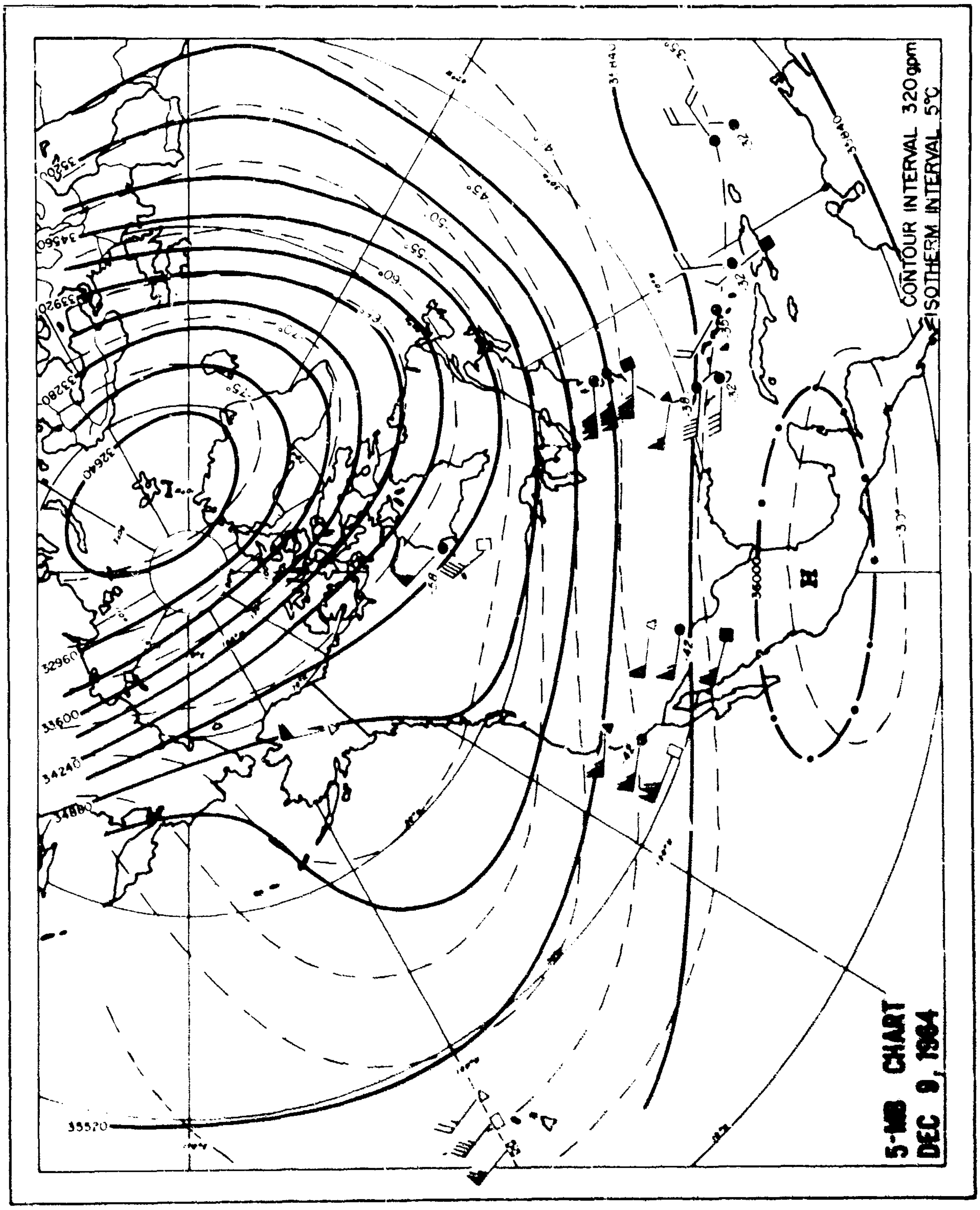
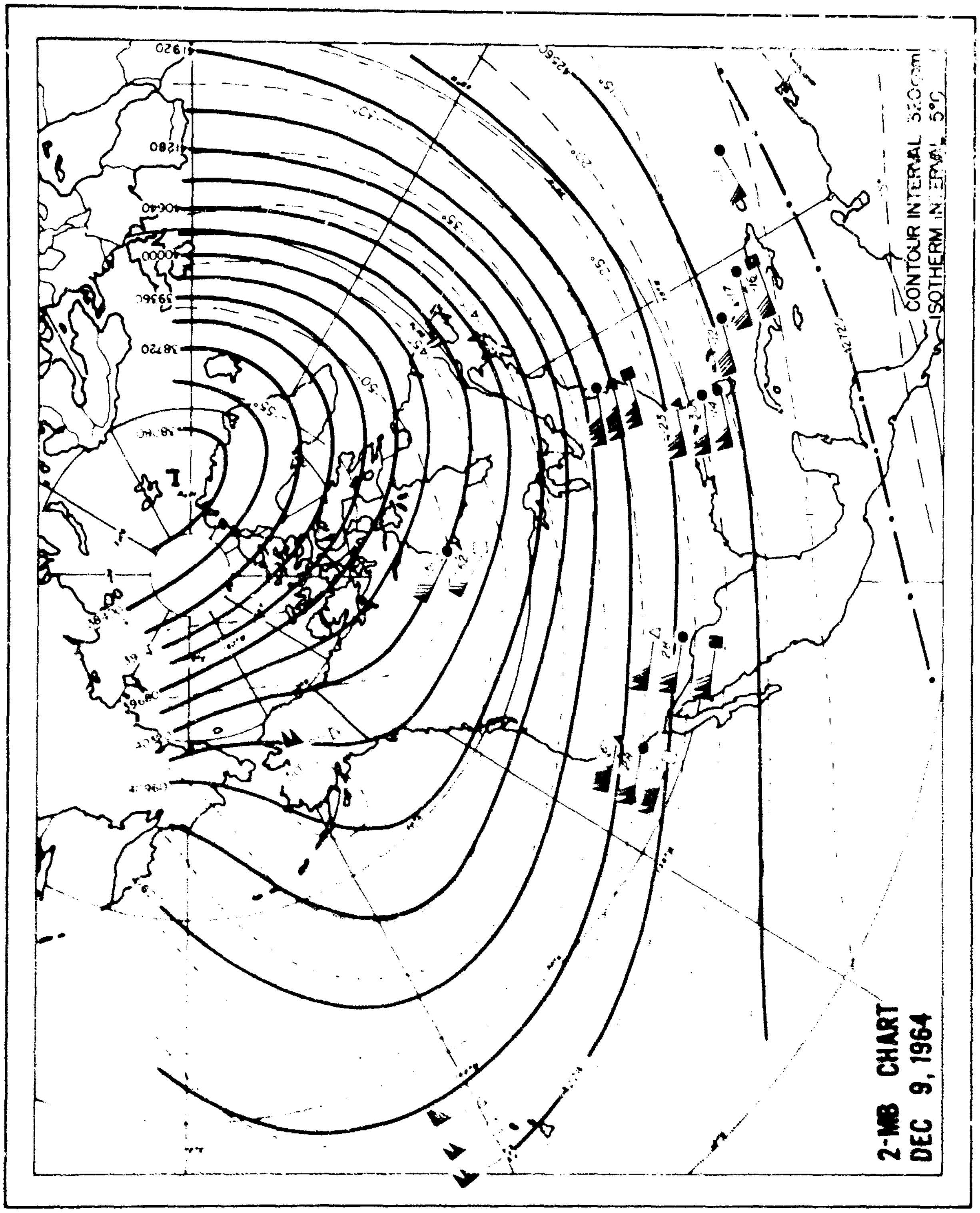
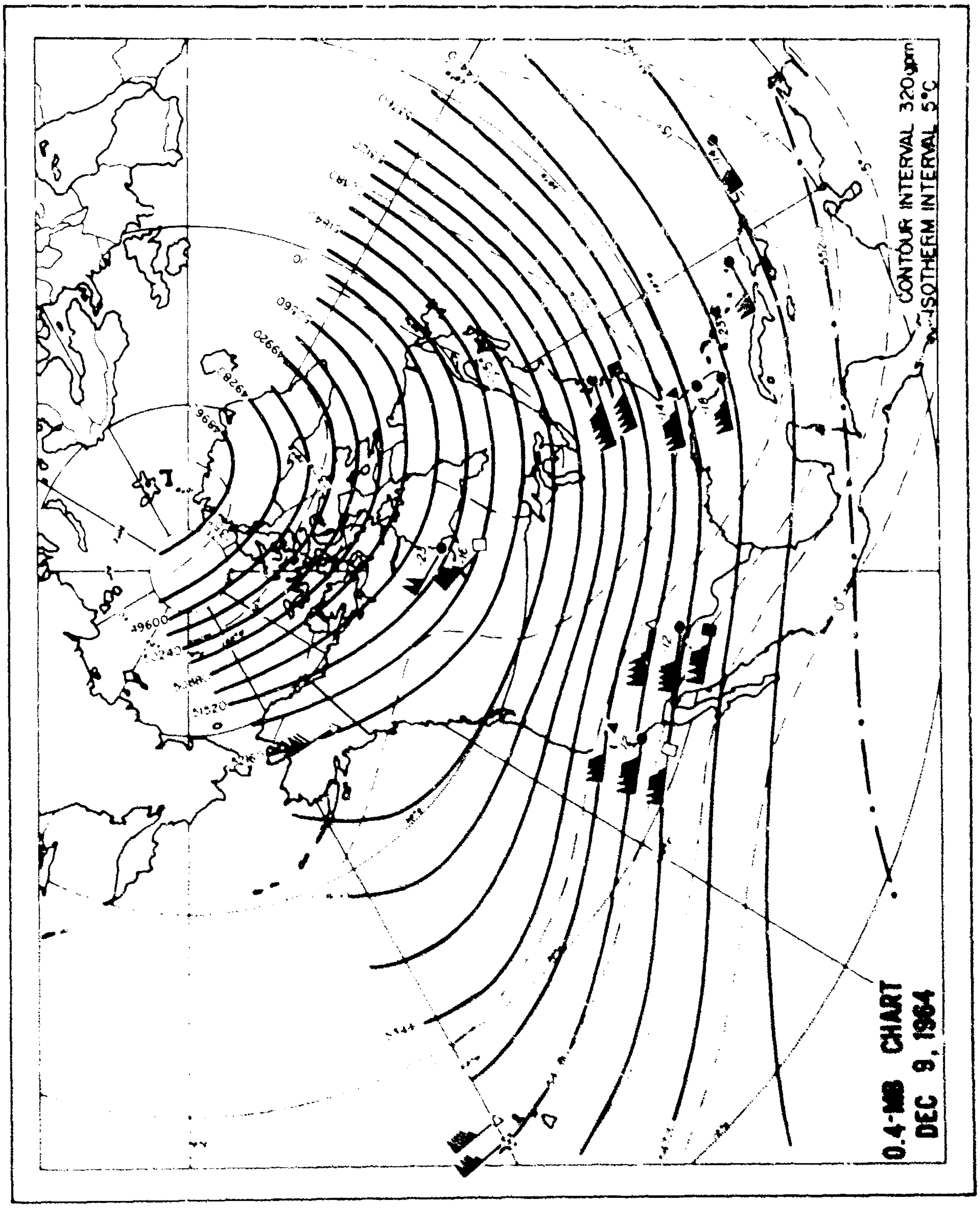
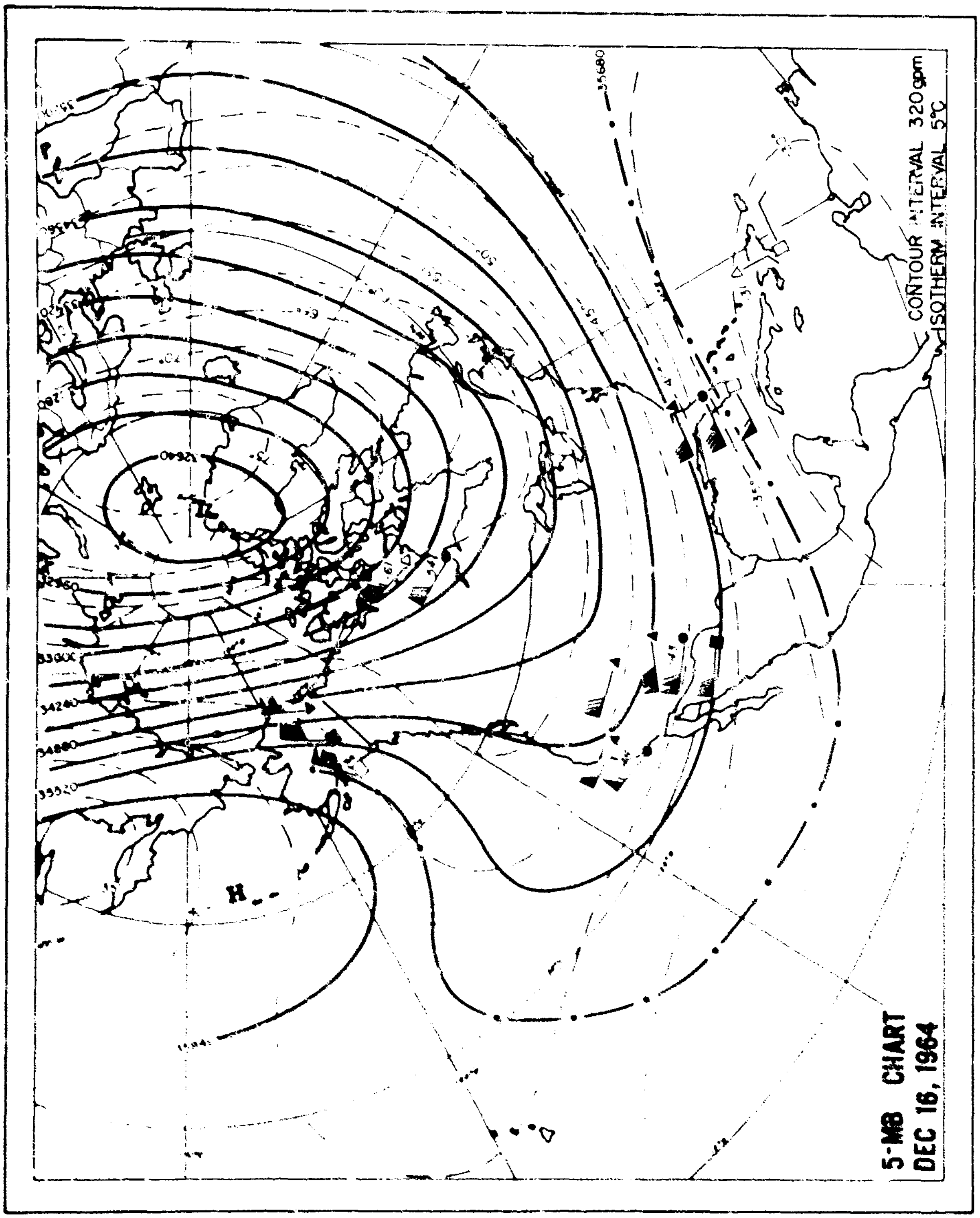
41280
41920
42560
H

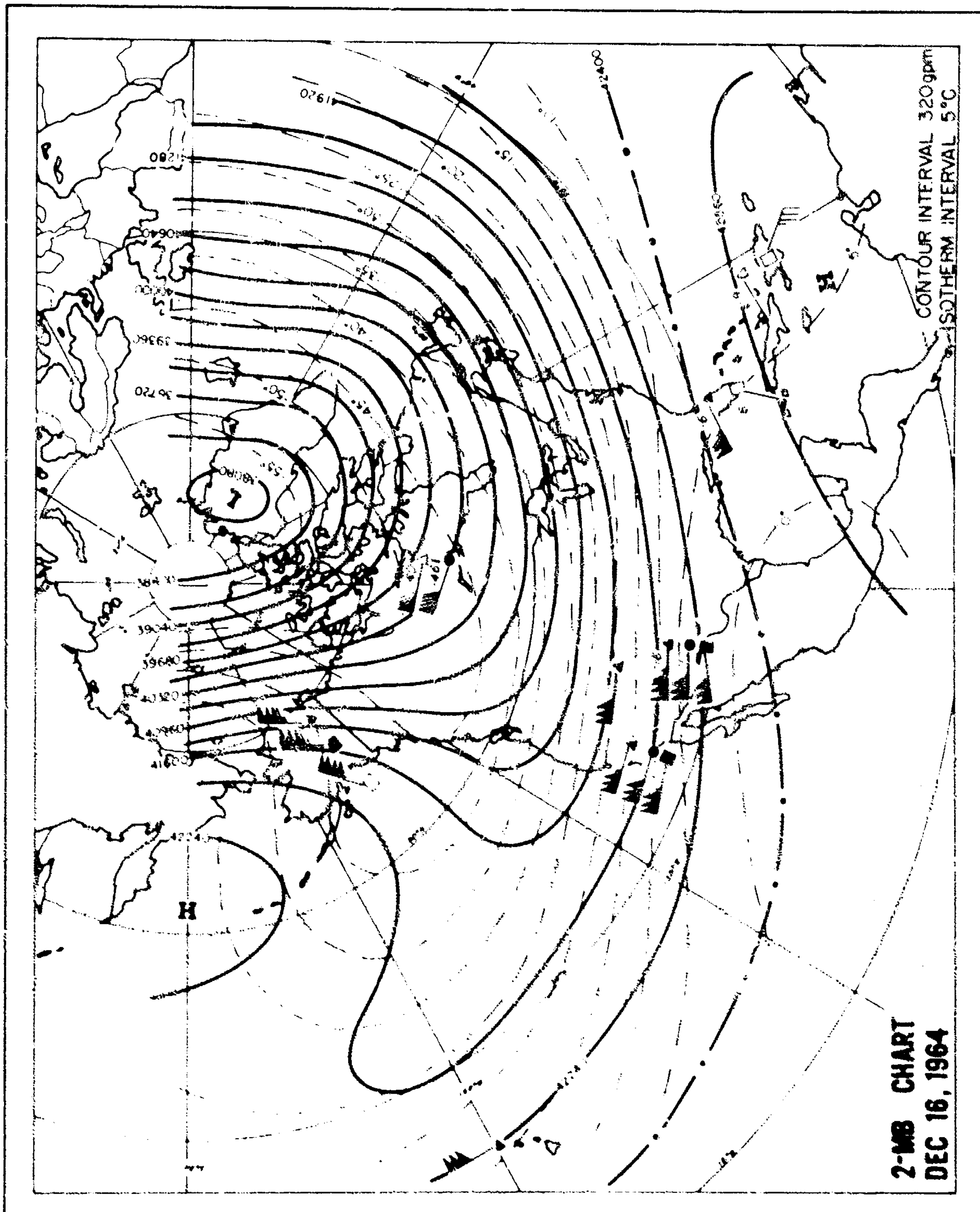

0.4-MB CHART
DEC 2, 1964
CONTOUR INTERVAL 320gpm
ISOTHERM INTERVAL 5°C

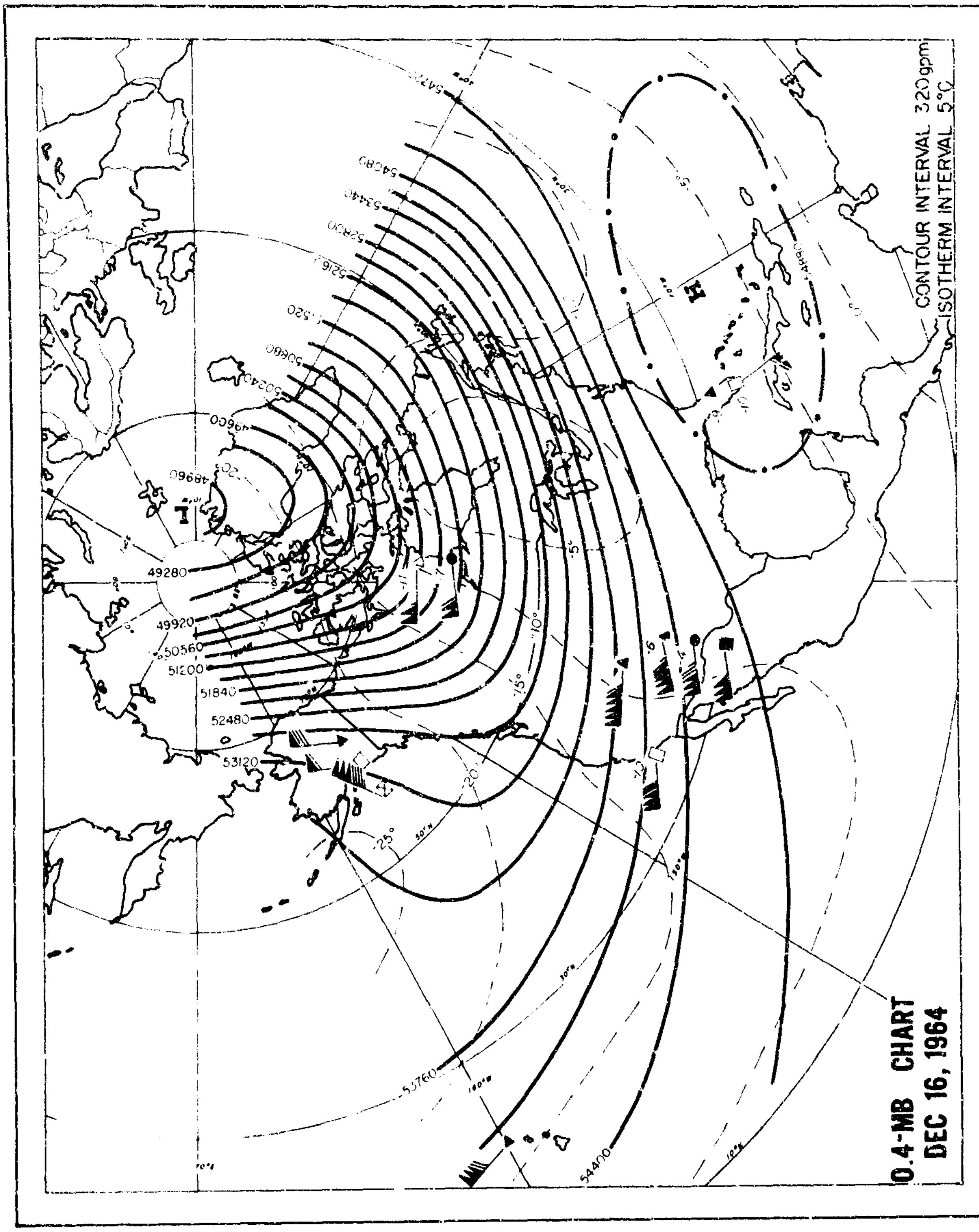

5-MB CHART
DEC 9, 1964
CONTOUR INTERVAL 320 gpm
ISOTHERM INTERVAL 5°C


2-MB CHART
DEC 9, 1964
CONTOUR INTERVAL
ISOTHERM INTERVAL 5°C

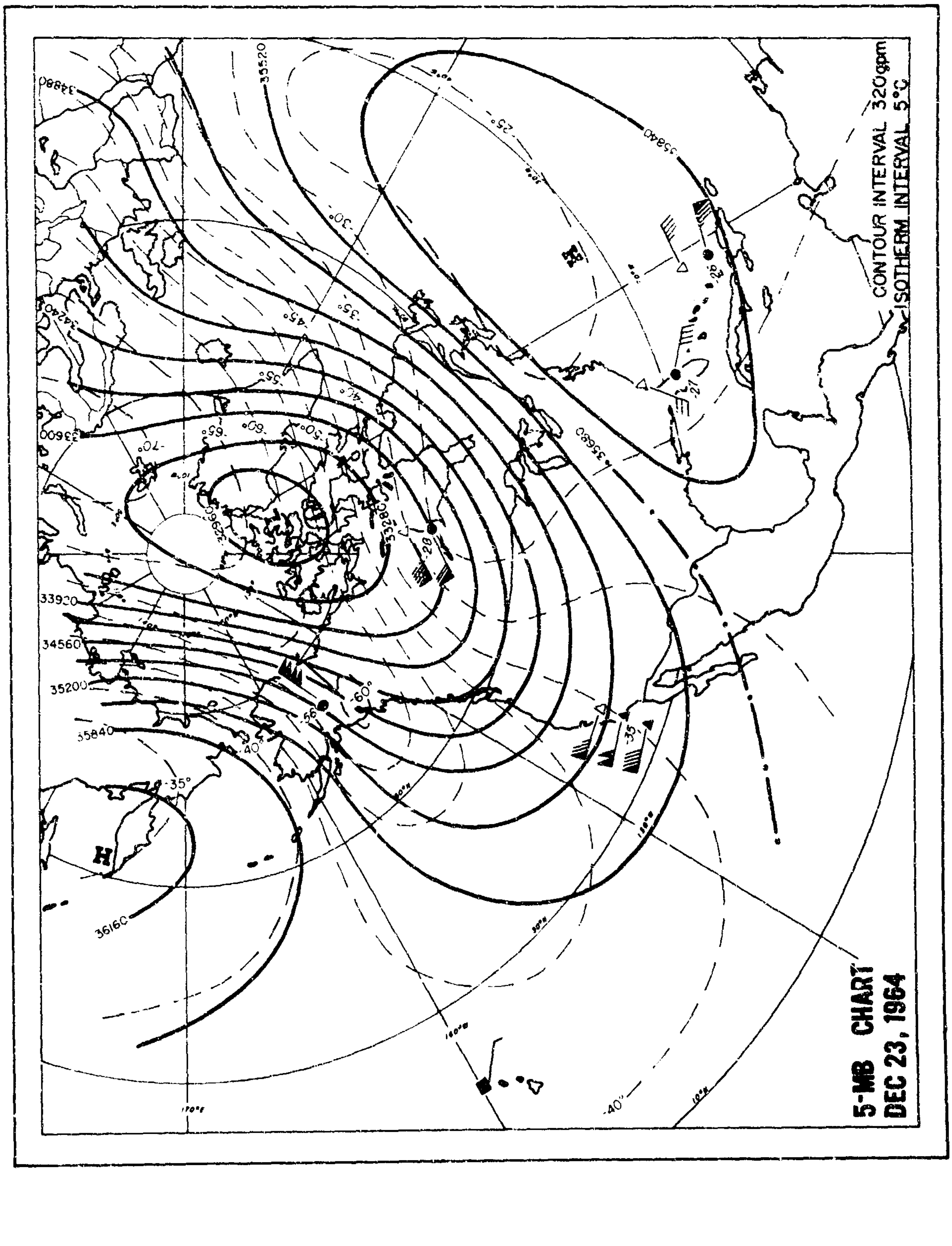

0.4-MB CHART
DEC 9, 1964
CONTOUR INTERVAL 320 gpm
ISOTHERM INTERVAL 5°C

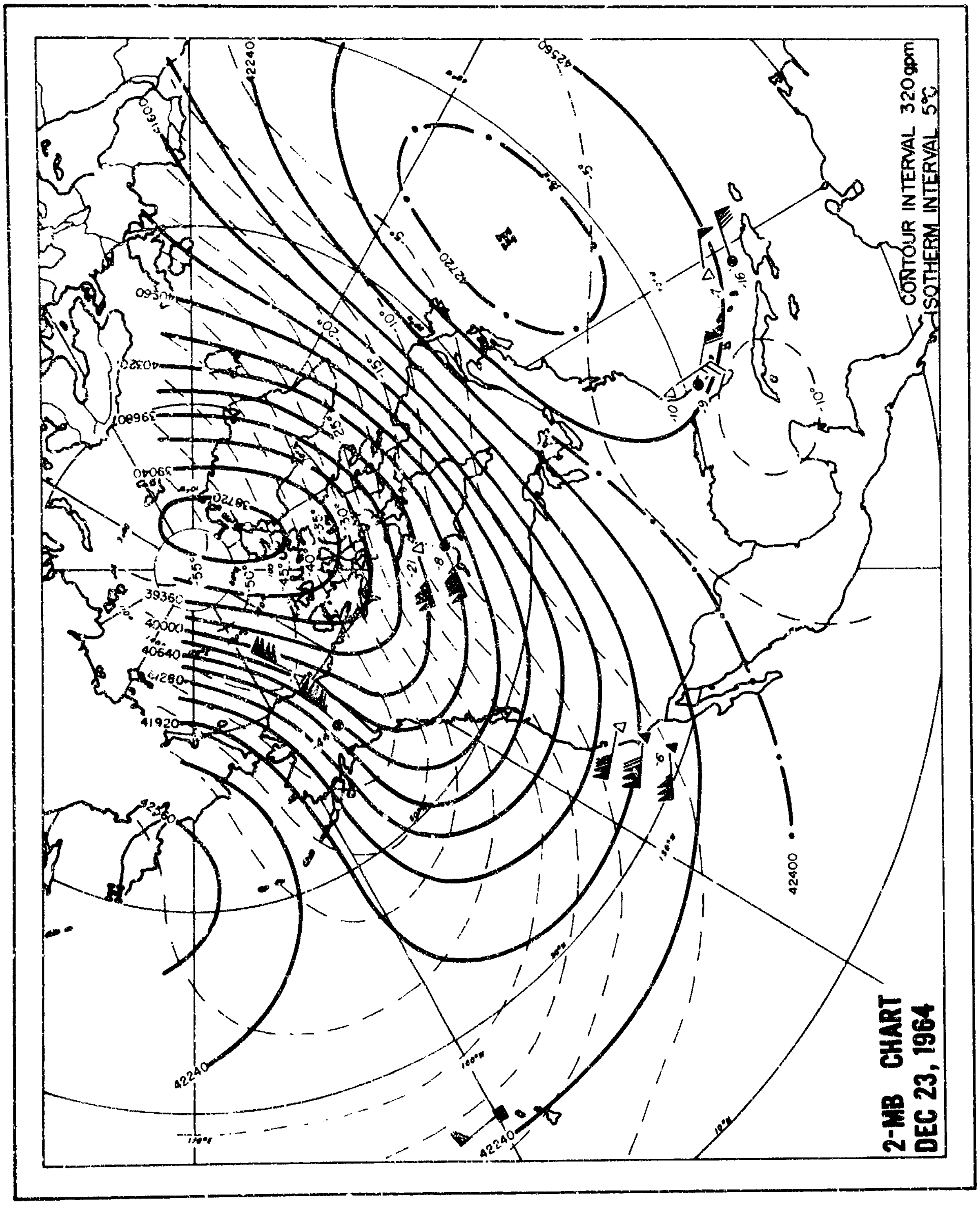

5-MB CHART
DEC 16, 1964
CONTOUR INTERVAL 320 gpm
ISOTHERM INTERVAL 5°C


2-MB CHART
DEC 16, 1964
CONTOUR INTERVAL 320gpm
ISOTHERM INTERVAL 5°C

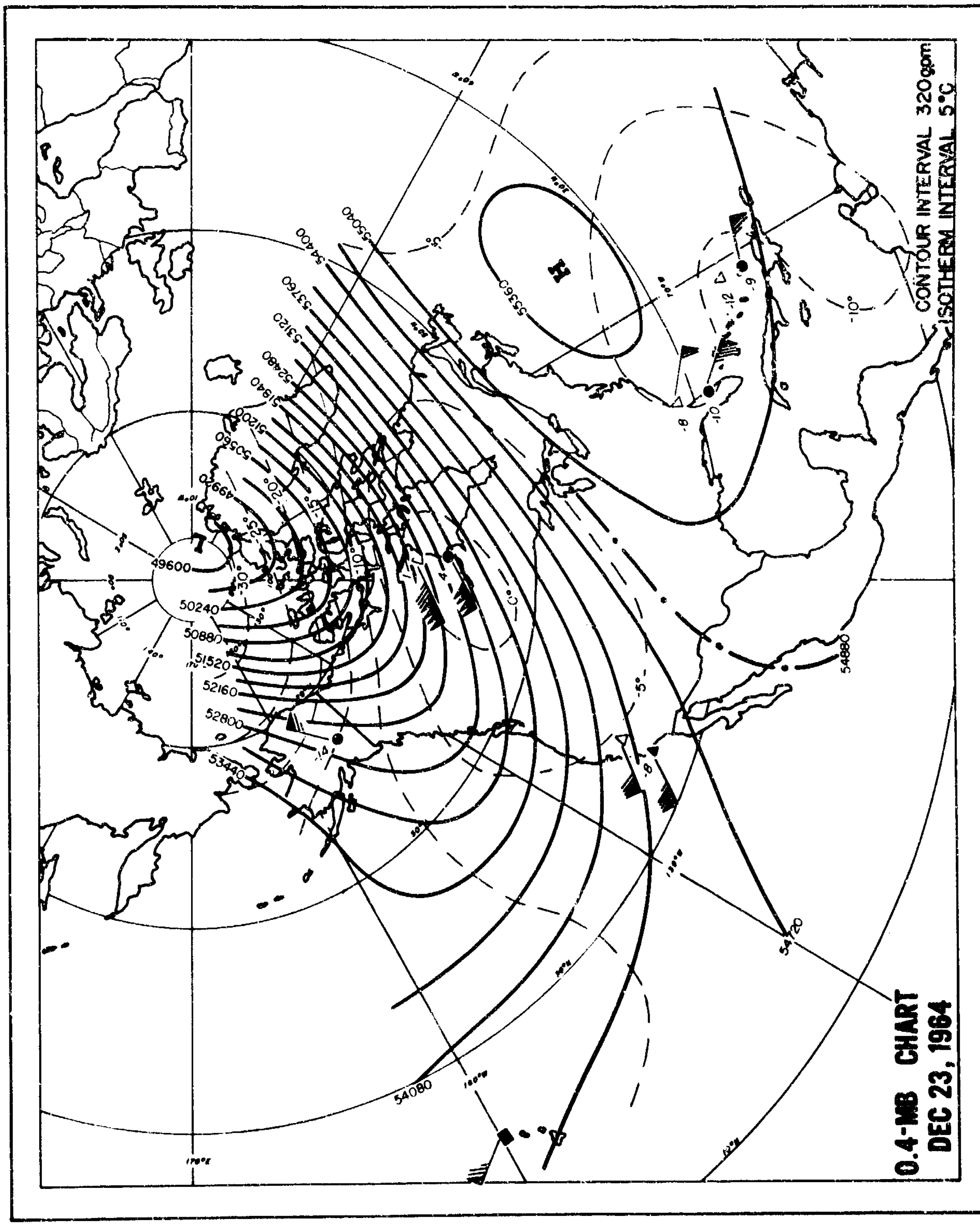


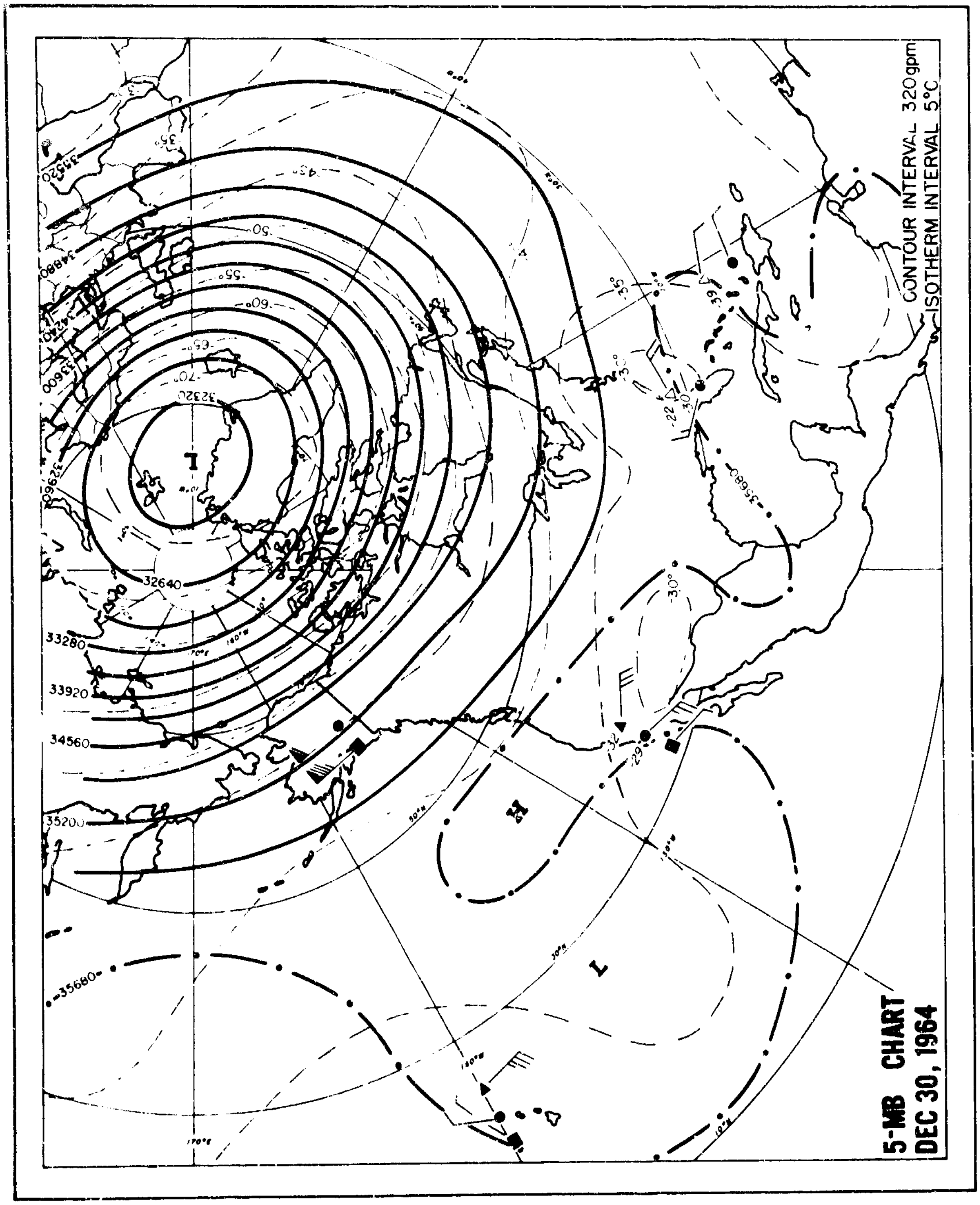
0.4-MB CHART
DEC 16, 1964
CONTOUR INTERVAL 320gpm
ISOTHERM INTERVAL 5°C
49280
49920
50560
51200
51840
52480
53120
53760
54400


5-MB CHART
DEC 23, 1964
CONTOUR INTERVAL 320gpm
ISOTHERM INTERVAL 5°C

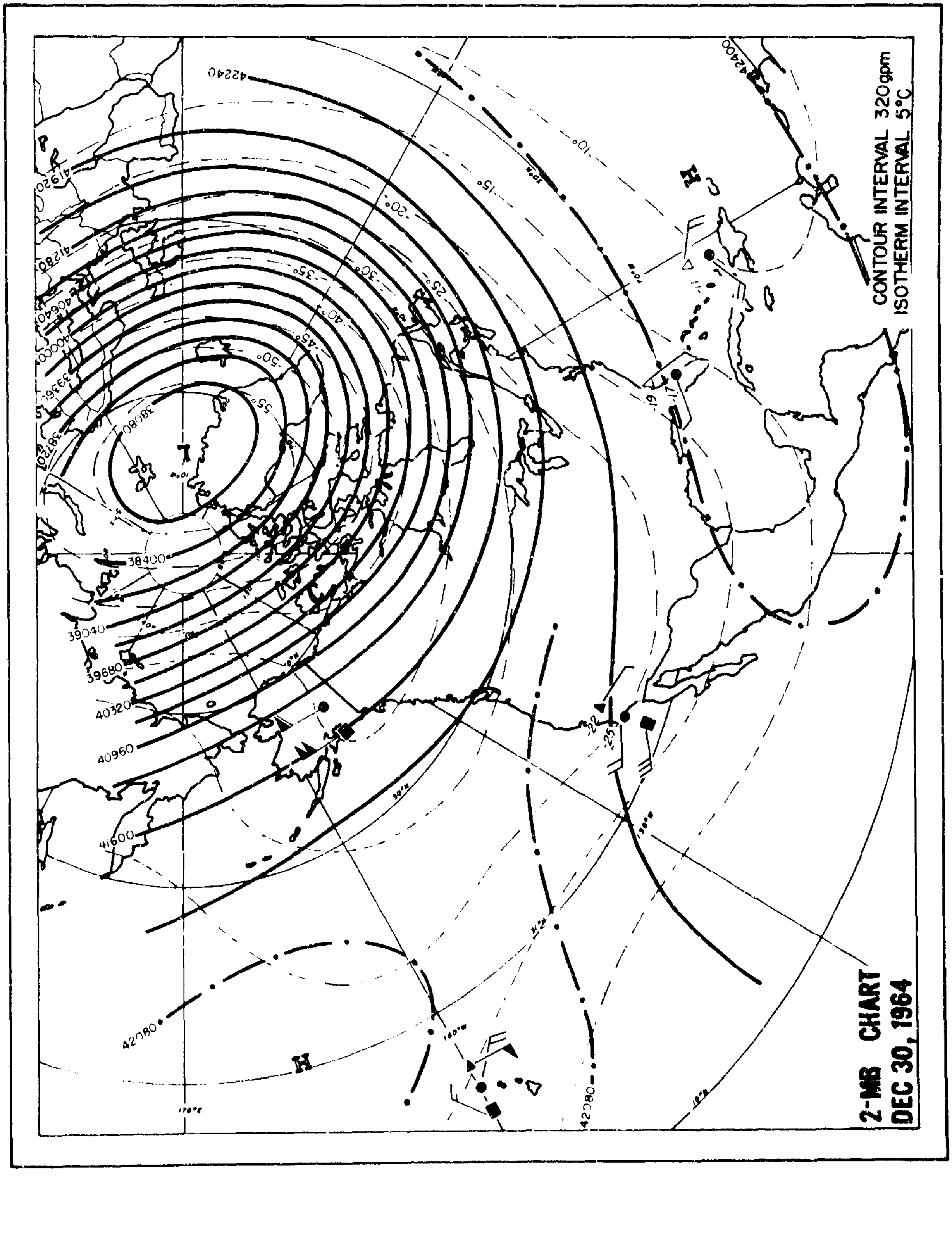


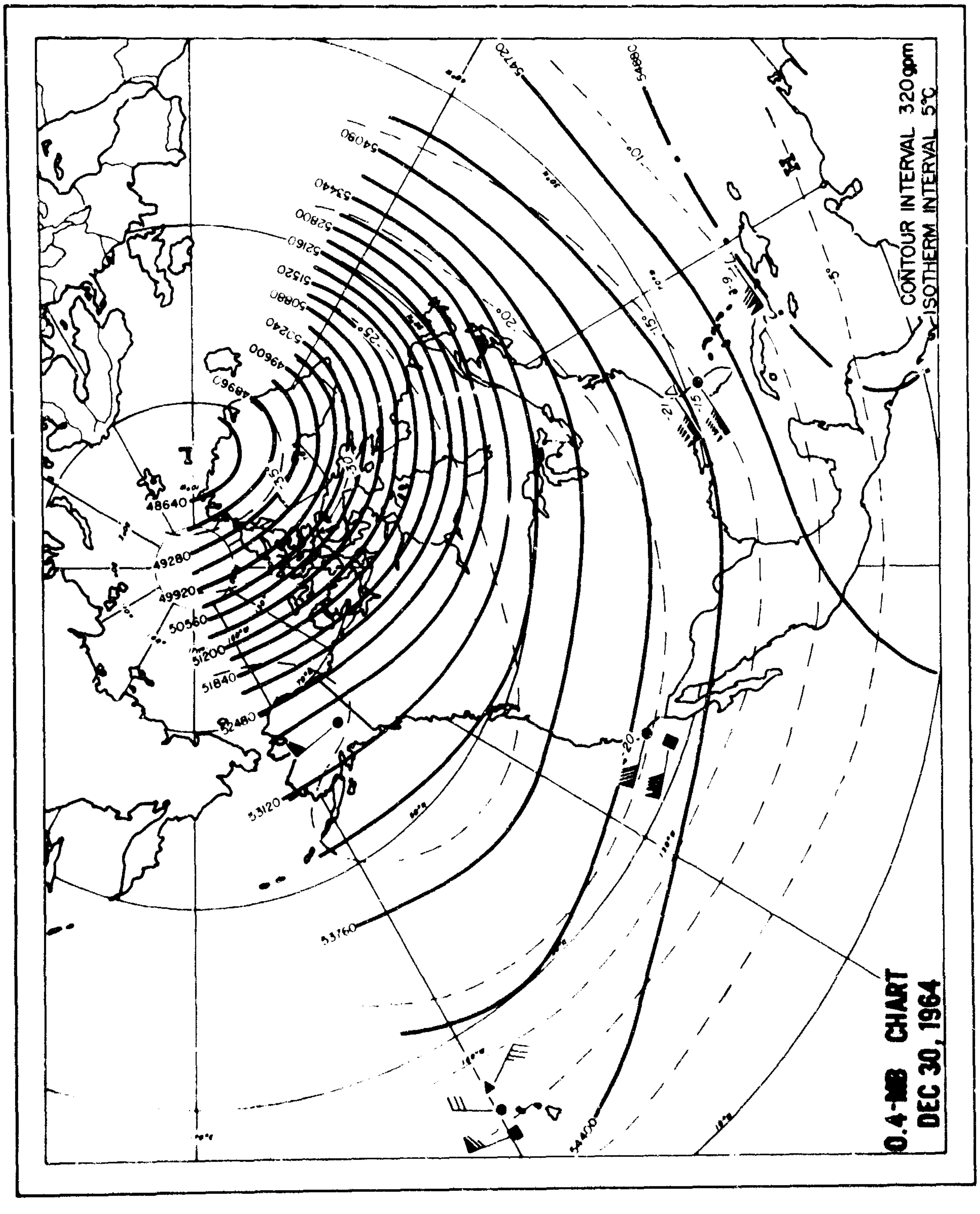
2-MB CHART
DEC 23, 1964


0.4-MB CHART
DEC 23, 1964
CONTOUR INTERVAL 320 gpm
ISOTHERM INTERVAL 5°C
H
L
49600
50240
50880
51520
52160
52800
53440
54080
54720
54880
55360
55040
54400
53760
53120
52480
51840
51200
50560
49920



5-MB CHART
DEC 30, 1964
CONTOUR INTERVAL 320gpm
ISOTHERM INTERVAL 5°C
32320
32640
33280
33920
34560
35200
35680
35680


CONTOUR INTERVAL 320gpm
ISOTHERM INTERVAL 5°C
2-MB CHART
DEC 30, 1964


0.4-MB CHART
DEC 30, 1964
CONTOUR INTERVAL 320 gpm
ISOTHERM INTERVAL 5°C